Chemical Week

April 4, 1953

Price 35 cents

Synthetic rubber plants will survive, prosper in private hands; that's industry's bet . . . . p. 15

CW Report sizes up chlor-alkali industry—where it stands, where it's heading . . . . . p. 28

Take a peek behind Hollywood's tinsel; you'll find a fat, diverse chemical market . . . . . p. 45

Novel synthesis of organomercury compounds slashes cost, sparks commercial interest . . . . p. 54

Badgered by wharf pilferage, exporters turn to sealed-in-steel shipments . . . . . p. 80

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Westvaco CHEMICALS

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With resistance to oxidation, low toxicity and low rate of hydrolysis, Westvaco Dibutyl Phosphite is now available for evaluation by potential quantity-users.

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***Solvent* in special solubility problems.**

***Additive* in extreme-pressure and crankcase lubricants to improve viscosity characteristics, add film strength and enhance penetrability.**

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***Intermediate* for the preparation of organic phosphorus compounds (For typical reactions, see Westvaco Technical Data Sheet S-38)**

PROPERTIES

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Boiling Point, 10 mm. Hg	115°C
Vapor Pressure, 20°C	< 1 mm. Hg
Specific Gravity, 35/4°C	0.971

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Sample quantities for evaluation on request.

SEND FOR DATA SHEET S-38

We will also welcome your inquiry for other phosphites

MARKET DEVELOPMENT DIVISION

WESTVACO CHEMICAL DIVISION

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Chemical Week

Volume 72 • April 4, 1953 • Number 14

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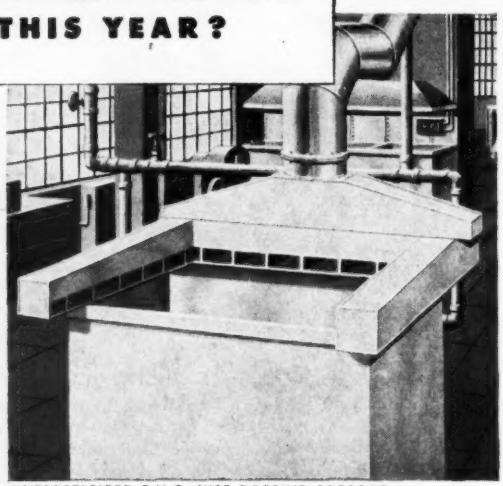
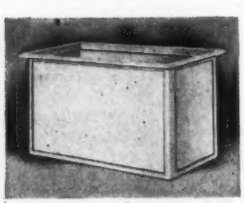


UNPLASTICIZED P.V.C. JUST DOESN'T CORRODE.

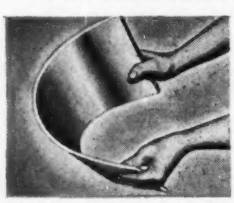
Not a cent...IF YOU SWITCH TO UNPLASTICIZED P.V.C. MADE FROM FIRESTONE EXON 402-A

Unplasticized P.V.C. is a new material of construction that is highly resistant to most corrosive elements. In many industrial applications, it has proven to be superior—less expensive—than customary metals. Check carefully the advantages of Unplasticized P.V.C. Then, for detailed information on how this new material of construction can help you in *your* business, consult Firestone Chemical Sales Division.



Fume Ducts, Tank Liners, Similar Applications—Unplasticized P.V.C. made from EXON 402-A is ideal for fume ducts and tank liners because it is highly resistant to moisture, acids, oxygen, sunlight, ageing and other corrosive elements.

Industrial Pipe—Naturally, piping extruded from Unplasticized P.V.C. is resistant to all types of corrosion. What's more, it is extremely light weight in comparison to metal...therefore easier and less expensive to handle.



Versatility—Unplasticized P.V.C. made from EXON 402-A can be welded, sawed, sheared, stamped, milled, planed, drilled, embossed, rolled, cemented. It is easily worked on conventional metal and wood working equipment.

How does this new material of construction fit into *your* picture? Have your engineers consult the Firestone Chemical Sales Division on proper applications of Unplasticized P.V.C. made from EXON 402-A...or write:

Firestone ... EXON ... *Chemical Sales Division*

☆ FIRESTONE PLASTICS COMPANY
POTTSTOWN, PENNSYLVANIA
A Division of Firestone Tire & Rubber Co.

IMPORTANT: Firestone supplies EXON 402-A only. This resin is used by many of America's leading fabricators of Unplasticized P.V.C. end-products.

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Not a cent... IF YOU SELL THEM

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America's leading manufacturers are becoming more and more *corrosion conscious!* And no wonder. Every year, corrosion costs industry millions of dollars.

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These advertisements were designed with one thought in mind: to suggest Unplasticized P.V.C. to businessmen as a possible solution to their corrosion problems. In doing this, the series will stimulate an increased demand for this new material of construction. Have *you* considered ways in which you can adapt this new material of construction to products you now make or could make with your present production facilities?

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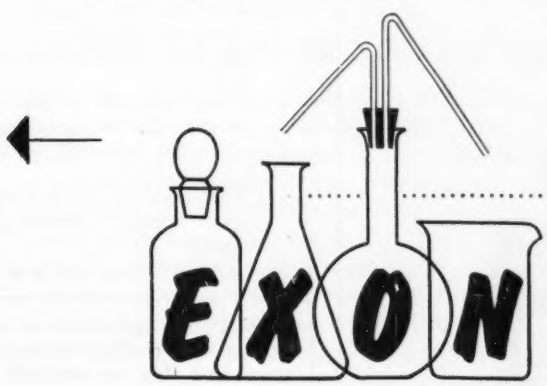
What's more, Unplasticized P.V.C. made from Firestone EXON 402-A can be welded, sawed, sheared, stamped, milled, planed, drilled, embossed, rolled, punched, cemented. It is easily worked on conventional metal- and wood-working equipment.

☆ ☆ ☆

Firestone has the experience and technical background to help you meet the increased demand for Unplasticized P.V.C. For detailed information on applications...and for advice and consultation on new uses you may discover ...call or write:



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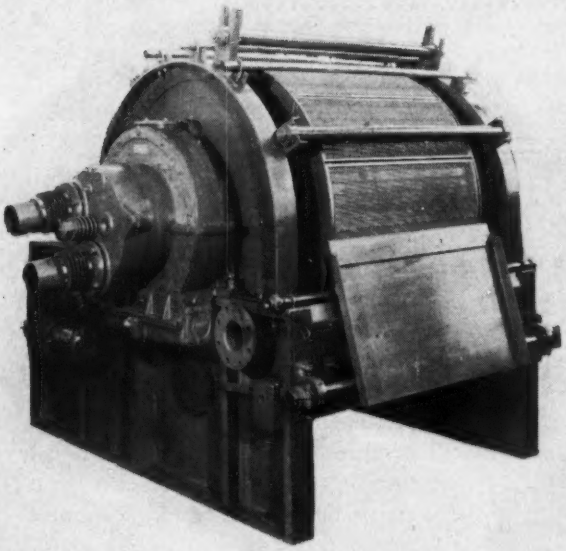
DEPARTMENT 11-H.

FIRESTONE PLASTICS COMPANY

POTTSTOWN, PA.

A Division of Firestone Tire & Rubber Co.

NEW VACUUM FILTERS FOR NEW PROCESSES



Every Eimco continuous filter either vacuum or pressure is a custom built machine designed and constructed to meet the specific requirements of your process.

Our testing and development department is staffed with chemical and metallurgical engineers whose long training and experience enables Eimco to offer filtration equipment exactly suited to your process.

The machine pictured above is but typical — all acid proof materials, panel deck, press roll blanket with wash apparatus, large automatic valve with high capacity for multiple wash separation and large volumes of filtrate.

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EIMCO A424

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OPINION . . .

Alabama Enterprise

TO THE EDITOR: Your Mobile area news article (*Mar. 7*) closes with an observation about the desirability of a by-products pulp and paper industry in this area . . . We have recently awarded a contract to Rust Engineering Co. for the construction of a tall oil processing plant at Bay Minette, Ala. . . . which seems to anticipate your suggestion . . .

We have processed tall oil at Bay Minette since 1948 . . . the new plant will provide capacity for anticipated additional demands . . . and for a number of new products developed in our research laboratories.

We will process raw materials from kraft paper mills in the area . . . The estimated cost of the new plant, on which construction has already started, will be $2,700,000 . . .

E. F. SISSON
Vice-President, Engineering
Newport Industries, Inc.
Pensacola, Fla.

Water Tempest

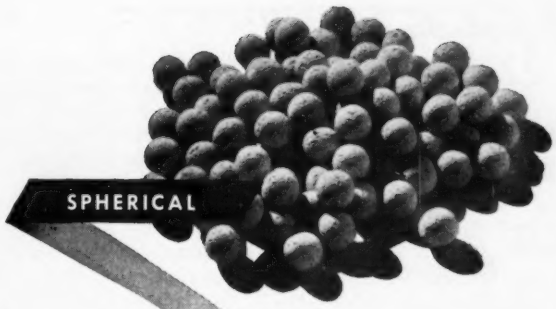
TO THE EDITOR: It is not clear from your report on fluoridation ("Tempest in a Reservoir", *Feb. 14*) just what your attitude toward fluoridation is . . . It certainly demands very serious consideration. This is not just a temporary project . . . the poisoning of our water supplies is to be a permanent thing, if the law does not interfere and save us . . .

Many angles seem to be entirely ignored by the proponents . . . one cannot help but marvel at the cocksure presumption and self-assurance of those who are now pounding their propaganda into the public mind with sledge-hammer insistence. Here are some points that are ignored:

(1) Unconstitutionality of mass medication, savoring of totalitarianism.
(2) Total disregard of the factor of individual susceptibility . . .
(3) Differing condition of health of individuals . . .
(4) Undetermined amount of natural fluorides consumed in food . . .
(5) Impossibility of gauging how

CW welcomes expressions of opinion from readers. The only requirements: that they be pertinent, as brief as possible.

Address all correspondence to: W. A. Jordan, Chemical Week, 330 W. 42nd St., New York 36, N.Y.



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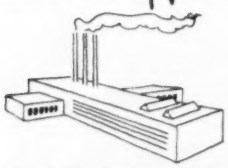

is the 15-year performance record of LAPP CHEMICAL PORCELAIN. As a material of construction Lapp Porcelain offers chemical inertness, strength of body and zero porosity. It handles problems of corrosion and contamination with performance unmatched by any other material. At surprising low cost, too. For example, a Lapp valve costs but a fraction as much as expensive lined valves. And in most plants serves longer and better. Write for bulletin giving characteristics and specifications of Lapp valves, pipe and fittings towers and tower packing and special shapes.

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Lapp PROCESS EQUIPMENT

CHEMICAL PORCELAIN VALVES • PIPE • RASCHIG RINGS • PULSAFEEDER CHEMICAL PROPORTIONING PUMPS

much water each person will drink . . . one perhaps five times as much as another . . .

(6) Effect of weather conditions on safe percentage of fluorine to be added . . .

(7) The 99.5% money wastage represented by mass application to total water supply . . .

It is the hard-earned tax money of the people that is being poured down the drain in this absurdly costly project (specifically, $1,943,000 in the District of Columbia) . . .

(8) One ppm is above the margin of safety . . . the University of Mexico quotes 0.9 ppm as the danger limit . . .

(9) The Select Committee on Chemicals in Foods and Cosmetics . . . unanimously counseled "go slow" in fluorine introduction . . .

(10) The known difference between natural organic fluorides and inorganics re body assimilation . . .

(11) The difference between natural calcium fluoride found in water sources and sodium silicofluoride . . . of which Washington is using 2,200 lbs. daily . . .

Dr. Scheele's reference to "classic" fluorine studies, to the employment of "statesmanship" to "convince skeptics" are . . . amusing . . . since the tactics of proponents have included only one-sided arguments, refusal to meet on the open platform with those holding opposite views, employment of . . . coercion . . . inquisition methods . . .

There is one misstatement in your report . . . "Most of the national opposition is led by the Christian Science Church." This is untrue . . . in fact, it has been a source of some disappointment that the Christian Science Church . . . has consistently withheld support from the antifluoridation movement . . .

Any precipitate and premature conclusions based upon incomplete experiments are absolutely worthless, and to act on such conclusions is dishonest, dangerous and unjust . . .

VERA E. ADAMS
President
Citizens' Committee on Fluoridation, Inc.
Washington, D. C.

Regiment vs. Squad

TO THE EDITOR: In the letter you published from Thomas L. Hagan, Chief, Dept. of Dental Health . . . (*Mar. 7*) the gentlemen states, anent fluoridation: "I think the experience of public

GRAVER PROCESS VESSELS

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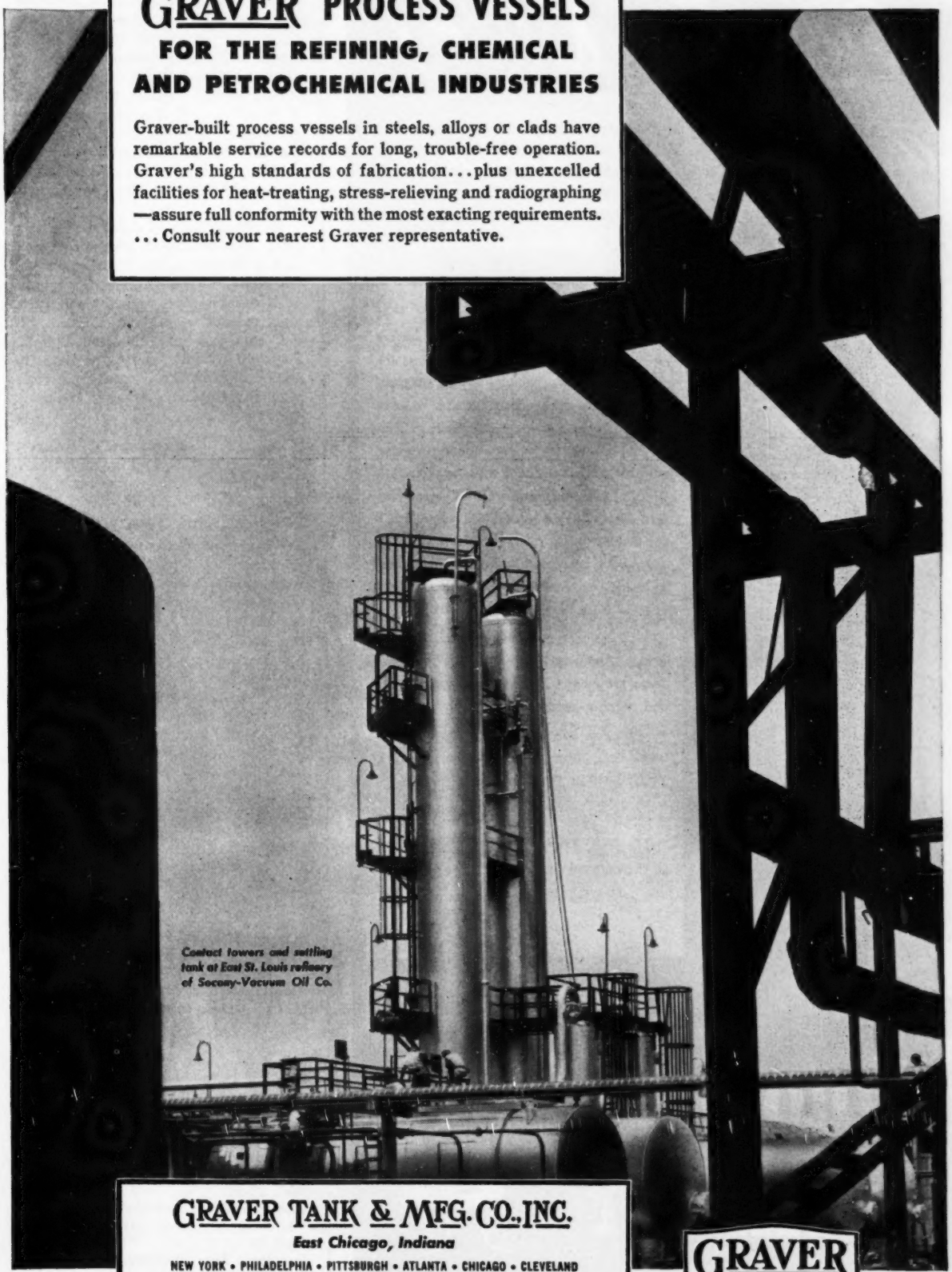

Contact towers and settling tank at East St. Louis refinery of Socony-Vacuum Oil Co.

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OPINION . . . . . .

health authorities employing water fluoridation as a disease preventive is not unlike experiences during the time when water chlorination was beginning to be used extensively . . ."

The saving word in this statement is "think" . . . If this gentleman were old enough to know, personally, about the . . . public reaction to the introduction of chlorination . . . he would be too old to be on the Federal payroll . . .

As the designer of public water supplies and treatment plants for over half a century, with direct, personal knowledge of this subject . . . I have no hesitancy in pronouncing the statement as contrary to fact.

Comparison of the opposition to fluoridation with the opposition to chlorination is like comparing a regiment to a corporal's squad in the same sequence . . .

FREDERICK O. RUNYON
Runyon & Carey
Newark, N. J.

Distinct and Separate

TO THE EDITOR: Quite a few readers apparently received the impression from your news article "Fungicide Quartet" (*Mar. 14*) that in my recent speech before the AATC I referred to the fungicides mentioned by trade name . . .

My address contained . . . a broad survey of commercially available and time-tested fungicides, but none was designated by its trade name, despite the fact that we are manufacturers of fungicides and our trade names have been used by others in technical papers . . .

CHARLES C. YEAGER
Technical Director
Scientific Oil Compounding Co. Inc.
Chicago, Ill.

CW, in rounding up several fungicide developments in one story, did mention Reader Yeager's observations on fungicides as a distinct entity, hopes that no reader misread what we said. —Ed.

DATES AHEAD . . .

Electrochemical Society, 103rd meeting, Statler Hotel, New York, N.Y., April 12-16.

Pennsylvania Mfg. Confectioners' Assn., annual conference, Lehigh University, April 23-24.

Hannover Heavy Industries Fair, annual exhibition, Hannover, West Germany, April 26.

American Zinc Institute, 35th annual meeting, Hotel Statler, St. Louis, Mo., April 27-28.

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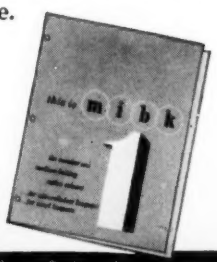

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NEWSLETTER

Dragging its feet no longer (CW Newsletter, Mar. 28), the government has now sold the alumina-from-clay plant at Salem, Ore., to Harvey Machine Co., Torrance, Calif. Built during the war at a cost of $5 million, the plant was sold to Harvey for $325,000—20% cash, the balance to be paid quarterly over the next 10 years with 4% interest on the unpaid balance.

The government's experimental operations were unsuccessful, and the facilities were later leased for ammonium sulfate and manganese dioxide production. Harvey, however, plans to use the unit for further experiments on producing alumina from local clays, tying in with its interests in primary aluminum production.

Almost every day brings further official word on polyethylene expansion plans. Spencer Chemical (Kansas City) now confirms that it will build a 45-million-lb. plant near Orange, Tex., on the site it just acquired (CW Newsletter, Mar. 7). Spencer is licensing Imperial Chemical Industries' patents; and the latter firm will train Spencer personnel, assist in engineering design, furnish production know-how. Spencer has also entered into a long-term agreement with Gulf Oil to purchase ethylene from the latter's Port Arthur refinery.

Next week, Spencer's stockholders will meet to consider increasing authorized indebtedness of the company, which plans to tap its present creditors for an additional $10 million.

But the real polyethylene "sleeper" is Monsanto, which quietly made its plans while speculation was raging about a dozen other firms. It will build a 66-million-lb. plant by 1955, expects to boost output to 99 million lbs./year by 1957. Monsanto thinks that tonnage will amount to 22% of the total, incidentally, and thus its market researchers look for a 450-million-lb. industry by then.

Monsanto has been conducting high-pressure polymerization research at its Dayton, O., research center for the past three years, is now constructing a second pilot unit there. With all this stress on production technology, it's a fair inference that the company isn't buying the whole I.C.I. package, as is Spencer.

International Minerals & Chemical will bring onstream this summer its new hydrochloric acid and magnesium oxide plant. Raw material for the process is by-product magnesium chloride, obtained by ion exchange of potash ore to produce potassium sulfate. The chloride brine is purified, concentrated, and then decomposed by heat to yield hydrochloric acid and a high-purity magnesia lower in calcium, iron and silica than common commercial grades. The magnesia will go into electrical and refractory equipment, the acid into the oil-well acidizing market.

Another potash project is still in the planning stage. The National Farmers Union, a cooperative with a half-million members in 20 Western states, will decide soon on a $10-million plant in New Mexico. The Union owns 15,000 acres of potash land near Carlsbad.

Fly in the ointment is the fact that water must be piped in. Cost

studies are now under way, the outcome of which will tip the decision. The plant, if built , will be financed partly with outside funds; and one of the established potash firms in the area may undertake the project for the cooperative.

Also under consideration is a triple superphosphate plant at Canon City, Colo., to process rock from Union-owned land in Utah. Proposed plans call for construction by New Jersey Zinc Co., of $2-million plant to recover sulfur dioxide from its smelting plant. This would be converted to sulfuric acid and piped to the fertilizer plant. Total cost: $6 million. The cooperative would sell most of the potash and the superphosphate to its own members.

The Bureau of Mines, still pushing oil-shale research, came out this week with a new, continuous process that retorts shale in three seconds. The older batch-type process takes hours.

In the new technique oil shale is crushed to ¼" or smaller, and the "gravel" is carried through a hot tube by superheated steam. Advantages claimed: better-quality oil and gasoline; a higher proportion of such premium products as benzene, toluene and lower straight-chain hydrocarbons; high flexibility, to control quality and types of products. Balancing these, though, is the high cost of crushing—and no economic studies have been made to see if the game is worth the candle.

Modifying an anachronistic law is the aim of Standard Oil of California. It has asked the Oregon state legislature to fix up an old statute so that the company can fill an order for phenol without first getting a prescription. Standard's legislative representative told the House Medical Affairs Committee that the firm had unwittingly broken the law for many years, since a clause in the state pharmaceutical statutes classifies phenol as a "deadly poison" to be sold—whether it's to plywood firms or glue manufacturers or anyone else—only on prescription.

Of greater moment is a law enacted this month by Idaho's state legislature. It empowers the commissioner of agriculture to designate areas within the state where restrictions on 2,4-D and related herbicides are necessary to prevent injury to crops. He may establish regulations or even prohibit use—and he can do it on his own initiative following a hearing or restrictions can be put into effect by petition of 25 or more landowners. Violation of such restrictions is a misdemeanor subject to fines ranging from $25 to $500.

Chemical firms in the Niagara Falls area are breathing easier this week. The New York Public Service Commission has denied rate hikes proposed by Niagara Mohawk Power Corp. After several months of hearings, the P.S.C. concluded that the $2.4-million raise was "not justified either from a revenue need or from the standpoint of power costs."

On Ellis Island this week, awaiting the decision of a deportation hearing officer, is Charles Doyle, allegedly a long-time Communist Party member who tried to give the Reds a grip on U. S. chemical production through Communist control of the CIO Gas, Coke & Chemical Workers.

Doyle was a vice-president of Gas-Coke during World War II, was ousted in the union's 1946 purge of left-wingers. He later went to Canada for a union meeting, was barred re-entry and subsequently picked up in New York for "surreptitious" illegal entry.

. . . The Editors

how to cage an idea

Conoco's new $2¼ million research laboratory at Ponca City, Okla., is an idea factory. Conoco looks to it for the discovery and perfecting of products and techniques, to keep the company in the forefront of a fast-moving industry.

Because idea-making is a fluid process, idea makers must have fluid housing. When Wigton-Abbott was called on to design, construct and equip these Geophysical, Production and Central Research laboratories this veteran engineering firm faced many special problems as well as these two fundamental requirements:

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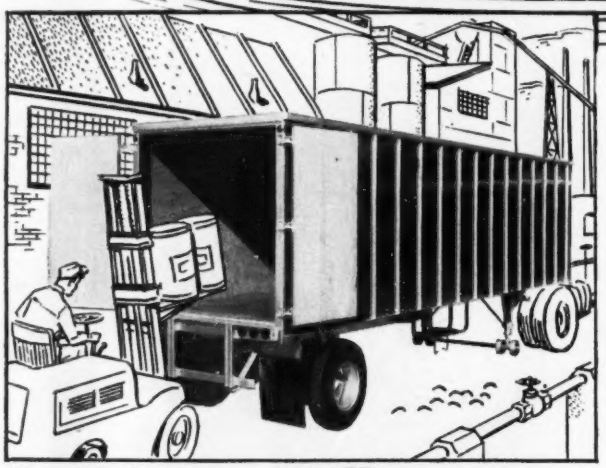
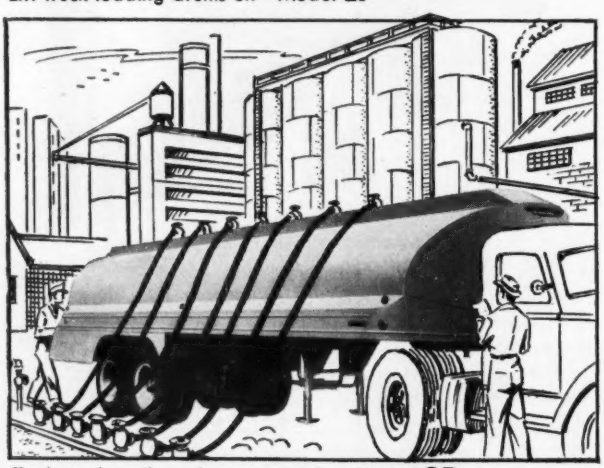
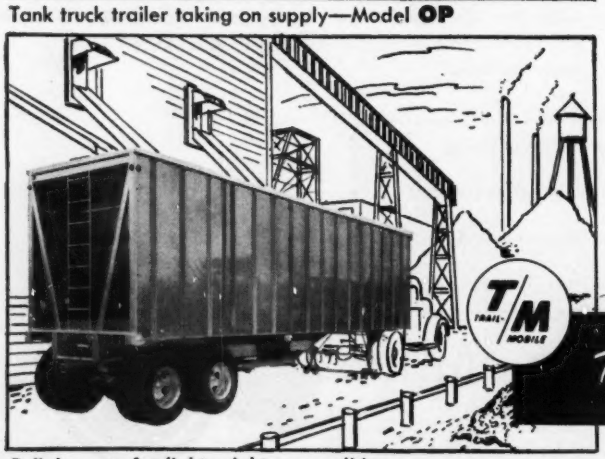
A CATALYST ON WHEELS



Lift-truck loading drums on—Model **EP**



Tank truck trailer taking on supply—Model **OP**



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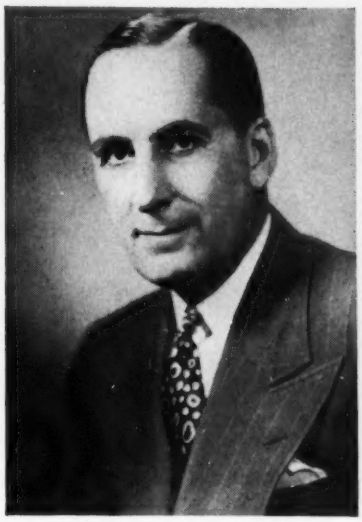


GOODRICH'S RICHARDSON: Crude rubber still a strong competitor.

GENERAL'S O'NEIL: Crude rubber to become a specialized product.

Impatience on Synthetics

The school of thought favoring private ownership of the country's synthetic rubber plants, determined to get quick action on the question, is showing no patience with President Eisenhower's request for more time to plan the auction.

Required by present law to send a disposal plan to Congress by April 15, the White House first asked for a 90-day postponement of that deadline, now is willing to settle for 30 days' grace. But the anti-government-ownership bloc in Congress, headed by Rep. Paul W. Shafer (R-Mich.), wants to have the matter threshed out before that.

Meanwhile, rubber, chemical and petrochemical company executives are perusing charts and tables, trying to figure out which of the 29 U.S. synthetic rubber facilities they'd like to buy if the price is right. For them, it's a question of which plants would be handiest to have during future stages of the joust between synthetic and natural for the lion's share of the rubber market.

What's Involved in Push to Get Government Out of Synthetic Rubber Business:

Type of Facility	Number of Plants	Average Cost to U.S. as of 12/31/52	Average Book Value as of 12/31/52	Average Annual Capacity
Copolymer (GR-S)	13	$12,720,000	$5,850,000	66,000 long tons
Butyl (GR-I)	2	26,590,500	8,802,000	45,000 " "
Butadiene (alcohol)	2	38,421,000	11,065,500	107,500 short tons
Butadiene (petroleum)	8	25,600,000	5,790,000	67,400 " "
Styrene	1	15,131,000	4,199,000	57,000 " "
Cold rubber	1	386,000	158,000	22,200 long tons
Catalyst	1	332,000	109,000	——
Testing laboratory	1	2,144,000	811,000	——

Profit on Paper: Now held by the Reconstruction Finance Corp., a federal agency doomed to expire next year (*see p. 18*), the synthetic rubber business has been booming; production for fiscal year 1952 is listed at 715,000 long tons of GR-S and 83,500 tons of butyl rubber—about 84% of capacity.

By RFC bookkeeping, net profit for that fiscal year was $16.1 million, out of a $416.5 million sales volume. So far, the government has put more than $700 million into synthetic rubber plants, but "net book value" of the 29 remaining facilities stood at $167,590,000 as of last Dec. 31.

Customers for bulk synthetic rubber are pretty well concentrated. In 1952, the "big four" tire companies accounted for 63% of total sales volume; the 16 next largest tire companies took 14%; and 20 other companies bought a little more than 5%. The rest—less than 18%—went to about 660 firms.

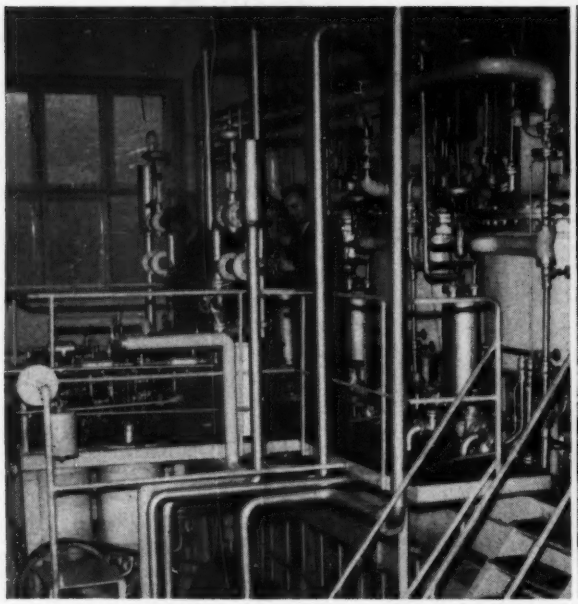
Unstinted Confidence: Executives of rubber companies appear to have no doubts as to synthetic rubber's destiny. Men like W. S. Richardson, executive vice-president of Goodrich, and William O'Neil, president of General Tire & Rubber, say without hesitation that the industry will survive and prosper under private ownership.

Synthetic's future, says O'Neil, is assured by "the fact that in 70% of the instances in which rubber is used, synthetic is more desirable." This means, he believes, that crude rubber eventually will become a specialized product.

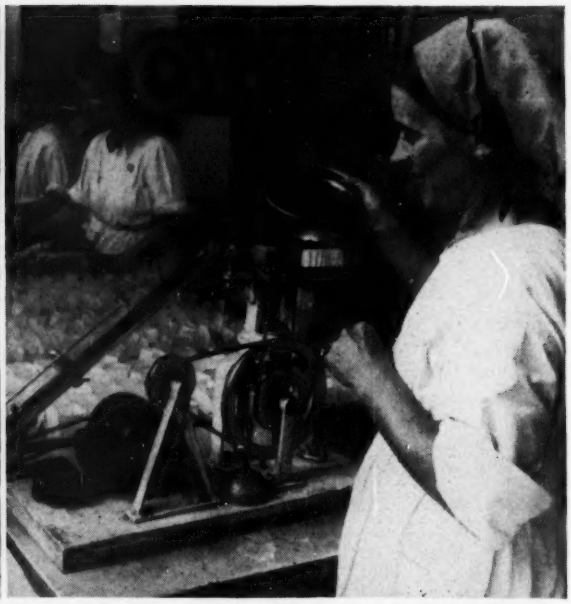
Planning is Secret: So far, prospective buyers haven't dropped hints as to which of the RFC plants they're planning to bid on. Richardson wouldn't comment on this matter; O'Neil says General probably will be interested in purchasing just one plant —"not necessarily" the one General has been operating at Baytown, Tex.

Ultimately, what the government can realize on selling these plants will depend upon how many companies agree with the RFC's forecast for the industry:

Says RFC: "It is expected that future world requirements for new rubber will so greatly exceed the supply of both natural and synthetic as to necessitate the construction of new synthetic rubber facilities to satisfy the demand."



CZECHOSLOVAKIA'S FIRST PENICILLIN PLANT: Reported . . . to be supplying all domestic needs.



RUMANIAN PEOPLES REPUBLIC: A medical plant in Bucharest . . . packing carbocif tablets.

Satellite Chemicals: Infirm Foundation?

Within the past few years, each of the satellite nations, goaded by Moscow, has been desperately trying to expand its chemical industry. A major reason: the satellite bloc's shortage of nonferrous metals, which must be replaced by chemicals. Czechoslovakia alone has failed to meet expansion goals; repercussions rocked the Gottwald government, hang over any new leader.

In addition to the urgency for synthetic fuel, rubber and plastics, both heavy industry and agriculture behind the Iron Curtain are clamoring for greater supplies of sulfuric acid; the ever-growing propaganda machine is demanding increased quantities of paper and pulp. Agriculture has become more and more dependent upon artificial fertilizers.

With all these thirsty takers crying for a largely expanded chemical industry, the pressure is on the satellites. Each has predetermined goals of expansion; Poland's six-year plan insists that the chemical industry must increase its production by 350% compared with '48. Czechoslovakia's quota has been set at 162% over 1948; East Germany is expected to increase output 182% by 1955 (compared with 1950). Hungary's deadline to increase its output by 138% (over 1949) has been shortened from 3 to 5 years; Rumania plans to increase 264% in its five-year-plan period.

On the surface, with the exception of Rumania and East Germany, all satellites administer their chemical industries themselves . . . but the hand of the Russian economic council (KOMEKON) is felt through "directives." Rumania's chemical industry is completely integrated into the Soviet-Rumanian company, Sowromkin, in which the Russians have a controlling interest. In East Germany, most of the major chemical works* are owned by the SAG (Sovietische Aktiengesellschaft), Russian-controlled.

Taking a Closer Look: Allowing for an expected unreliability, scrutiny of the detailed development plans of the chemical industries in the various satellites reveal these "facts":

- In Poland, the production of soda and sulfuric acid heads the priority list of inorganic chemicals. Goals: 389,000 tons of burnt soda by 1955; 162,000 tons of caustic soda in the same year.

Also, according to the six-year plan, production of sulfuric acid is to be doubled, should reach over 540,000 by 1955. (Reports indicate that both domestic and imported pyrites are to be used, also anhydride and gypsum.) Output of artificial fertilizers is to be increased three times, until by the end of 1955 it reaches 230,000 tons nitrogenous fertilizer and 250,000 tons phosphorus fertilizer. Production of synthetics will be pushed; dyestuffs will be expanded 200% while paints and varnishes will increase fourfold.

Within the pharmaceutical industry, emphasis is being placed on the production of hormone products, vitamins, penicillin and streptomycin. It is "hoped" that the pharmaceutical industry's output at the end of the six-year plan will be seven times larger than in 1949.

Except for the most important mass products, production goals in the various "plans" are never expressed in terms of quantitative units, but in terms of the monetary value of the production. This fact highlights a chronic disease common to all satellite countries—the craving to produce high-priced goods independent of their actual importance or the demand for them in order to meet established production quotas. The pharmaceutical industry is a case in point; production has long lagged behind domestic demands.

New plants coming into operation have been reported at varying intervals: a sulfuric plant at Wizow came onstream in the summer of 1951; at Dobra, a block of plants to produce synthetic gasoline, phenol, paraffin and plastics is going up on the ruins of the former German Buna Works; at I. G. Farben's former site at Kedzierzyn, a nitrogenous fertilizer plant is being built.

* I. G. Farben, Leunawerke, AGFA-Wolf and Bitterfeld Betriebe.

• In East Germany, the development and production of plastics is being touted as a major goal. There is also considerable research work reported under way in varnishes, chemical oils, and synthetic fats. Synthetic gasoline's goal is 175% over 1950 output; artificial fertilizer's, 160%; sulfuric acid's, 156%; and caustic soda's, 372%.

To meet its appointed standards, the Germans' "plan" to build two new soda plants (at Bärenburg and Staasfurt) and one (location unrevealed) to produce sulfuric acid.

• In her five-year plan (recently shortened to three years), Hungary is scheduled to build 38 chemical plants. The chemical industry's slice of the total industrial production is pledged to jump from 9.8% in 1939 to 14% in 1953—a feat, if achieved. Production of artificial fertilizer alone is reaching for a 375% hike in comparison with 1949.

No substantial details about the development of Rumania's chemical industry have filtered out. The Rumanian press, however, has been playing up the production of synthetic composites.

• The Czechoslovakian chemical industry, long the giant of Central Europe, is reported to be undergoing expansion "along the lines that can best supply its domestic markets, and if possible assist Russia through exports." Expansion is planned mainly for dyestuffs, synthetic fuel, oxygen, plastics, paints and varnishes. All these goals were laid out in the first, unrevised five-year plan. But individually, in comparison with the efforts demanded in the other satellite countries, the expansion plans for the Czech industry appear modest.

Major strikes, organizational scrambles and individual cases of "rebellion" have been reported as responsible for the disorder. Mass executions during the last months of Gottwald's stormy rule included many chemical industrial leaders. Official reason for the nonfulfillment: Czechoslovakia is putting more weight behind her mechanical industry.

Major Goals: Of all the satellite countries, only East Germany, Czechoslovakia and Poland produce synthetic fuel. (Unconfirmed rumors talk of Hungary entering the field.) East Germany's factories date from prewar days, were the first dismantled after the war, were later reassembled. Poland took over German plants in the newly won territory in the East (at Dobra, Plonica); both were in a virtually demolished state.

In sulfuric acid, all have declared themselves to be interested in making themselves independent of imports. East Germany and Poland are reliably reported to have started manufacture from gypsum and anhydride. (Poland claims anhydride deposits in former German territory amounting to several hundred million tons.)

In comparison, the goal for soda is modest, receives little fanfare.

Potash is mainly to be found in East Germany, where three mines, with a capacity of 300,000/year, were opened after the war. Before the war, the East Zone's production was 800,000 tons of pure potash content, had climbed up again to 700,000 by 1946. But the 1948 goal (1 million tons) was not achieved; potash production remained at 800,000 tons.

In output of nitrogen, Germany again leads the other satellites; but her output is still considerably lower than pre-war figures. In superphosphates, however, Germany has slipped, while the other satellites have increased.

Chief Monkey-Wrenches: The satellites' greatest industrial problem is reported to be their acute shortage of machinery and equipment. Each one of them attempts to increase its potential at a considerably quicker pace than its investment in machines and equipment permits.

Moreover, production costs in the satellite bloc are, on the average, several times higher than in Western countries, though the government apparently pays scant heed to the fact. Its main objective is to make the satellite block independent of Western imports at any price.

Manpower has been used in most cases to supplant horsepower. Round-the-clock hours, strict enforcement of work discipline under the threat of labor camps, and an incentive system offering to workers with the best records membership in the "stachanovites" (the new aristocracy) have been introduced in most chemical plants.

Yet productivity remains low. More workers, longer hours, and incentive plans do not replace more and better machines.

Soviet government's main problem remains the replacement, modernization and enlargement of the existing machine parks. Conditions such as those in Czechoslovakia have made the lack more telling.

It is with this background that the USSR has been trying to establish some token of economic cooperation with the West (in Copenhagen in 1951 and in Moscow in 1952). The aim: import of Western machinery to speed the satellites' economic autocracy.

PRODUCTION CAPACITIES IN THE SATELLITES

(in thousand tons)

	Synthetic Fuel			Sulfuric Acid			Soda			Superphosphates			Nitrogen		
	1937	1949	1955	1937	1949	1955	1937	1949	1955	1937	1949	1955	1938/39	1948/49	1955
Czechoslovakia	200	300	...	166	...	...	...	...	...	152	198	399	24.5	30	...
East Germany	...	490	780	370	256	400	340	100	380	230	...	93	478	...	235
Hungary	...	...	...	...	...	...	...	...	...	44	16	..	0.4	...	...
Poland	...	100	...	181	276	540	30	56	162	175	164	250	51.5	55.1	230
Rumania	...	...	...	45	40	...	14	15	...	...	...	...	...	...	...

Notes: East Germany synthetic fuel '49 figure is calculated from official tables giving output in %; Poland '49 synthetic fuel figure is unofficial; East Germany sulfuric acid '37 figure is for '36; Poland, Rumania '37 soda figures, actually for '38; Poland and Hungary superphosphate '49 figures actually for '47; East Germany '49 figures for sulfuric acid and soda, actually for '50; Czech. '55 goal actually for '53.

RFC's Record on Chemical Loans, 1933-1952

Industries	Number of Loans	Total Amount of Loans
Paint, varnish & colors	153	$ 7,500,000
Animal & vegetable oils	251	36,000,000
Drugs, medicines, toilet preparations & insecticides	116	8,400,000
Soap & glycerin	41	2,400,000
Hardwood distillation, charcoal & naval stores	36	2,200,000
Fertilizers	150	15,600,000
Industrial chemicals	192	52,000,000
Miscellaneous chemical products	143	17,000,000
Total chemical loans	1,082	$141,200,000

End of Pump-priming?

The Reconstruction Finance Corporation—the government agency with perhaps the biggest impact on the chemical industry—may go out of existence in June of 1954.

Over the course of its two-score years, RFC has bought strategic materials, built dozens of chemical plants for war producers, built and operated the nation's synthetic rubber industry—and loaned many millions to a wide variety of chemical plants (*see table*).

After the war, RFC was ripped apart by Congressional investigators who turned up all kinds of influence peddling, finagling and outright crookedness. Ever since, there have been strong Congressional demands that the agency be eliminated.

Lending to Continue: End of RFC won't mean a complete termination of its functions, however. Informal agreement between President Eisenhower and GOP Congressional leaders is that lending will continue in a new agency to be created out of RFC and the present Small Defense Plants Administration. Theory is that only small loans—perhaps up to a maximum of $100,000—would be made to small business. Liquidation of RFC's outstanding loans will, of course, take years. Hope is that its other major function—synthetic rubber—may be ended through disposal of the plants by the time RFC's present charter expires June 30, 1954.

RFC's lending has dwindled during recent years. Record of postwar chemical loans:

Fiscal Year	*Number of Loans*	*Total Amount of Loans*
1949	69	$11,700,000
1950	109	$13,700,000
1951	53	$ 4,442,000
1952	27	$ 5,000,000
1953 (1st half)	18	$ 2,500,000

Banks Get First Choice: In general, RFC makes loans only to companies that are unable to get credit from local banks at competitive rates of interest. Loans recommended by field offices are gone over by local bankers, however, before RFC will actually approve them.

Among the largest chemical loans made in the past two years were $2,100,000 to Shea Chemical Co.; $460,000 to Reichard-Coulston, Inc., and $350,000 to Detroit Chemical Co.

Some of the loans to chemical and related companies were subject to criticism. For example, RFC made three loans to Carthage-Hydrocol, Inc., totaling $18.5 million, for construction of a plant to convert natural gas into gasoline and other petroleum derivatives.

The loans drew criticism during the Fulbright hearings in 1951. The committee said that since the firm was owned by oil companies whose aggregate wealth was estimated at $600 or $700 million, the firm should not have sought funds from RFC.

Defense Plant "Angel": During World War II, RFC built 161 plants for chemical production costing $119 million; 97 aluminum plants costing $812 million; 57 synthetic rubber plants costing $715 million; 52 magnesium facilities costing $453 million; 38 aviation gasoline facilities costing $245 million; and six pipelines costing $189 million.

The chemical industry was a big supplier of RFC's Defense Supplies Corp., selling to it, among other things, almost $3 billions' worth of aviation gasoline, $892 millions' worth of alcohol, $40 millions' worth of nitrate of soda; $31 millions' worth of benzol and $28 millions' worth of calcium carbide.

COMPANIES . . . .

• American-Marietta Co. has bought U.S. Plywood Co.'s Portland, Ore., glue-manufacturing division, and is operating it as Adhesive Products.

• Reichhold Chemicals, Inc., will set up a manufacturing division at Ballardville, Mass., to produce synthetic resins and raw materials for plastics. In anticipation of the move, Henry H. Reichhold personally acquired last December a substantial interest in Watson-Park Co., Ballardville, producer of 25 million lbs/yr. formaldehyde.

• Celanese Corp. of America has become an integrated chemical company. With two thirds of its capital invested in chemical plants and a reported 30% of its profits derived from the sales of textiles, plastics and chemicals, the move culminates Celanese's entry into the chemical field, dating back to 1928.

However, as 1952 made painfully clear, the volatile textile industry must still provide the bulk of Celanese's income. Last year, sales fell to $166.7 million—the lowest level since 1946; net plummeted almost 63%.

Officials of the company predict "a favorable outlook in 1953 for an increased consumption of yarn and fibers as well as for chemicals and plastics."

• The Armstrong Cork Co. will close its Camden, N. J., plant at the end of this year, having decided to consolidate all production of cork insulation at Beaver Falls, N. Y.

Production is scheduled for curtailment starting Oct. 1, for stoppage on Dec. 1, '53.

• Diamond Alkali Co. has changed the name of its subsidiary, Kolker Chemical Works, Inc., to Diamond Alkali Organic Chemicals Division, Inc. The subsidiary, purchased in Aug. '51 as part of Diamond's expansion program into the organic chemicals field, has plants in Newark, N. J., and Houston, Tex.

•

Allied Chemical & Dye Corp. stockholders will be asked to approve an incentive stock option plan for key employees at their annual meeting, April 27. The proposal: to offer some 80 key personnel a total of 150,000 shares of common stock at a price not less than 95% of market value on the day the option is granted.

•

East Texas Pulp & Paper Co. is planning to raise $25 million to build a pulp and paper mill in Jasper County, Texas. It expects to borrow $13,750,000 from institutional investors; $8 million from Time, Inc.; $3,250,000 from Houston Oil.

GOP Gets Oriented

Less red tape, fewer bureaucrats, lower taxes—those were the war cries as the Republicans moved into authority in Washington in January.

What will the change-over mean to chemical companies? The new policies haven't all been put into operation yet, but so far, outside of the sudden dropping of price controls, changes have been relatively moderate.

With the expiration of all price controls—including controls on sulfur—a milestone of government influence over business has been passed.

But the washout of price ceilings six weeks before the April 30 deadline is probably the most dramatic change you'll see out of the new administration for the next few months.

In many agencies, the Eisenhower regime has started to revise and revamp—but mostly the new team is still busy learning what the job is and figuring out what changes, if any, it wants to make.

High Officials, Low Budgets: By and large, the most immediate problems of the new chiefs:

- Getting top staff personnel.
- Cutting budgets to get in line with the President's policy.

The other major controls agency—National Production Authority—has no chemicals under control, and hasn't had for some time. A skeleton organization will remain so that in an emergency the Chemical Division can be brought to life quickly. Now heading the division is Arthur K. O'Keefe, on leave from his job as sales production coordinator of Naugatuck Chemical Div. of U.S. Rubber Co.

Commerce Department's Chemical Division went out of business when NPA set up a Chemical Division. Plans have not been announced by Secretary of Commerce Sinclair Weeks, but if the division is re-established, it is certain that budget restrictions will keep operations down below what they were in June, 1950. Some Commerce people would like to resume publication of the monthly drug and chemical report and other periodical surveys.

Data Tailored for Trade: But the outlook for Commerce Department activities is influenced by Weeks' tentative decision to create a new "Office of Distribution" of the kind proposed by ex-Secretary Charles Sawyer before he left. Weeks wants to gear Commerce statistical and business reporting services more closely to business needs.

Export controls are applied to a long list of chemical items. Some products, such as sulfur, are still under export quota because the domestic supply position "does not warrant unrestricted export."

NPA'S O'KEEFE: His skeleton crew ready to spring to life.

OIT is under some pressure to further tighten controls on shipments of drugs and other strategic materials that are finding their way into Communist or Communist-held countries. Three weeks ago, OIT appointed a committee to look into the export of antibiotics and sulfa drugs with a view to improving operations (*CW Newsletter, Mar. 14*).

Fuel Research Slackens: Bureau of Mines budget is expected to be slashed about 15%. Lack of money will effectively put the Bureau's synthetic liquid fuels program into low gear, but some work will be continued.

Food & Drug Administration's position in the proposed new Department of Health, Education & Welfare will remain unchanged. In fact, food and cosmetic manufacturers swamped Federal Security chief Oveta Culp Hobby with demands that the Food & Drug commissioner and staff be kept under civil service. Reason: industry men don't want politics to be any part of Food & Drug decisions. So, FDA chief Charles Crawford will stay on.

Fundamental research will remain low. The National Science Foundation finds itself with few effective supporters. It is probable that the 10 to 15% budget cut the administration has made all through the Truman budget will be applied to NSF, preventing any expansion in research grants.

Hey-day for Hydrides

Mark down a 100% physical expansion during the past year; add on a sixfold increase in sales during the past two years.

These items point up the 16-year growth of Metal Hydrides, Inc., from a company with three employees and two patent licenses, to a firm with 170 employees and better than $2 million in yearly sales in the specialized field of metal and alloy powders and metallic hydrides.

This week, in Beverly, Mass., Metal Hydrides was shaking down its newest chemical hydride production unit, preparatory to beginning full production. The new equipment installed in a spanking-new building will help to meet the demand for these hydrides* whose volume in 1952 doubled that of the year before, which, in turn, tripled the year before that. And the future, says Metal Hydrides, will be even better.

The increasing acceptance of these far-from-cheap materials is one point that Lew Davis, the company's new bespectacled president cites in discussing the company's future. Most other company sales, he asserts, have been too closely tied to military programs to bode well for peacetime success.

Actually, Metal Hydrides' present ability to look beyond the military is a result of government development contracts. Without such contracts, the company's position would not have been good enough to allow it to float a public stock issue. But its position, as of a year ago, was sufficient for such a sale, and the proceeds paid for most of the company's just-completed expansion.

* Specifically, lithium aluminum hydride, lithium borohydride and sodium borohydride. The materials are selective reducing agents, which tend to avoid side reactions that pull down yields and introduce impurities. They find their most promising use in syntheses of those vitamins, hormones, pharmaceuticals and other compounds with high raw material costs.

Spotlight on Expansion

CCDA focuses on the economics and mechanisms involved in expansion today.

"The need for outside financing" says Dow's Gerstacker "is universal."

"Expansion by acquisition is the high road to glory," avers Food Machinery's Hart, "but it is a rocky one."

Both financial and technological considerations shared the limelight at The Commercial Chemical Development Association's annual meeting in New York's Hotel Statler last week. Drawing a record crowd of 590, the all-day session featured provocative topics and thoughtful speakers. The result: plenty of interest and enthusiasm.

Kicking Off: Dow's Carl Gerstacker (treasurer) led off, stressed that the need for outside financing of expansion projects is universal among chemical companies today. And it has "materially altered the capital structure of the industry" because most has been through debt funding; additional capital obtained through the issuance of common stock since the war has been negligible.

Nonetheless, Gerstacker said, the basic source of capital for any chemical company is its common stock. And "today is a favorable time for a company to sell it."

Dow has financed its expansion largely by a combination of three methods:

- The sale of common stock to stockholders.
- Issuance of convertible preferred stock—a good vehicle for the sale of common.
- Some debt financing, since "bank money fits in well with certificates of necessity."

Both types are necessary to an expanding company. Stock issues are basic, but the established chemical company with expansion in mind should have some leverage in its capital structure. (And some senior capital is necessary to provide leverage.)

Just how much of each, poses a question: "How much can you eat and still sleep well?"

There is no simple answer, according to Gerstacker. Thinking in regard to financing chemical expansion should remain fluid, should include low cash dividends, the yearly sale of common stock to those receiving the dividends, and substantial long-term debt with sinking fund requirements.

The Quick Way: With a both-sides-of-the-fence perspective, (first by being "acquired," and later as "being a party to a lot of acquiring") Food Machinery and Chemical Corp.'s Ernest Hart cited the operating problems and advantages of expansion through acquisition. A "sound and compelling" reason for the move is a must, and there are many of them. Expansion of product lines in the same business, the securing of captive markets, acquisition of attractive patents, personnel, skilled research, and the possession of basic raw materials led his list.

But the "pitfalls" in the "highroad to industrial glory" are devious and deep. "Like most honeymoons," the drum-beating and folderol are soon over. Basic "organizational and personnel problems" flood in from all sides. Successful acquisition demands "money, know-how, a strong absorptive ability and plenty of patience and tact."

What the Investor Sees: Taking another tack, William Beckers (Spencer Trask) pictures the investor's attitude toward a growth company as "a relatively new investment concept." Said he: the rapidly expanding true "growth company has revolutionized investment thinking."

Uncle Sam's Import: The chemical industry's mushrooming has been "accomplished in spite of many government regulations having a deterrent effect" said C. E. Waring (Davison). EPT, price controls, credit controls, and local state regulations have made the road rough. But, guarantee purchase contracts, government loans, accelerated amortization of facilities, and allocation of certain strategic materials have been incentives to expand. "The record shows that the incentives offered have been remarkably effective —particularly accelerated amortization."

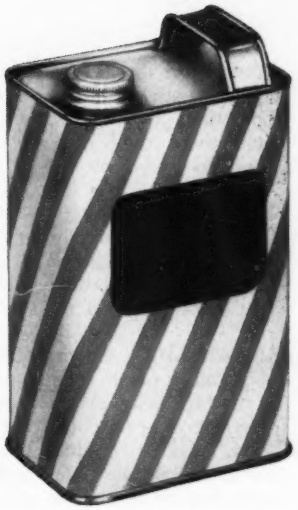
The reason: "Most authorities believe that its appeal to management lies in the expansion momentum achieved through the rapid return of capital, thus making it possible to finance many successive projects through the generation of internal capital."

Project Planning: CCDA's afternoon session was bread and butter to members "devoted" to a day-by-day separation of good and bad projects. The subjects: what constitutes smart research and market planning programs, and the happy marriage of both.

- Sydney T. Ellis (Commercial Solvents) classified projects, marked the importance of raw materials and patent positions, and other factors of development.
- William H. Mc Lean (Merck) complemented his comments with a

DOW'S GERSTACKER: "Capital structure has changed . . ."

CALCO'S KLIPSTEIN: "Into a buyer's market, suddenly . . ."



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discussion of marketing cost factors, and what constitutes a "satisfactory return in a reasonable time commensurate with the investment involved."

• Thomas Vaughn (Wyandotte) melded the two, detailed their interrelationships, and emphasized the importance of an evaluation and reevaluation of projects to the future of any company.

Plaudits and Honors: Capping the convention was CCDA's honor award presentation to Calco's Kenneth H. Klipstein "for outstanding accomplishment."

"Research and development programs must be supported to the fullest extent profits permit if the chemical industry is to successfully meet the potential threats to its progress," warned Klipstein in his acceptance address. "Greatly expanded capacity, reduced military requirements, or tariff changes could easily result in surpluses, losses, shut-downs and hardships."

"Commercialization of research and development must be pushed more aggressively than ever if we are to meet these threats."

LABOR

Four to One: In principal bargaining elections in the chemical processing industries during the past week, labor unions were victorious at four plants but were turned down by workers at one plant in the Deep South:

• At National Carbide's new acetylene plant in Calvert City, Ky., 89 of the 140 eligible employees voted for the United Gas, Coke & Chemical Workers (CIO) to be their bargaining agent.

• Near Denver, Colo., where Dow Chemical is operating the new Rocky Mountain Flats raw material plant for the Atomic Energy Commission, the AFL Metal Trades Council defeated Gas-Coke by 214 to 52. Eventually, employment at this plant is expected to reach 2,000.

• By a count of 186 to 154, the Oil Workers International Union (CIO) was chosen to represent employees at Mathieson's fertilizer plant at Pasadena, Tex.

• In Portland, Ore., employees of the newly established W. J. Voit Rubber Corp. have joined the International Chemical Workers Union (AFL), and are trying to get a straight hourly wage system instead of the present incentive system.

• Six unions were fighting for bargaining rights at the rayon and synthetic fiber plant of Courtaulds (Alabama), Inc., at Le Moyne, Ala., but all were rejected by the employees. Of the 207 votes cast, 143 were for "no union" and 47 were for the CIO Textile Workers.

•

Strike Evokes Lawsuit: Charging that the company was damaged by last month's "illegal" strike, attorneys for Columbia-Southern Chemical say they're filing a $50,000 suit against five AFL unions in Lake Charles, La. The attorneys contend that the two-day strike was intended to force the company to give to the pipefitters certain construction work that was being done by other workmen.

•

White Flags Go Up: Three strikes affecting the chemical process industries are over or virtually over this week, mainly on company terms.

• Most complete capitulation came in Montreal, Can., where employees of Canadian Copper Refiners gave up their eight-month one-week strike when it failed to force the company to recognize the Oil Workers International Union as bargaining agent.

• Crumbling away but still standing is the eight-month-old strike of ICWU local 28 against Jefferson Island Salt Co. at New Iberia, La.

• Chemstrand's nylon plant (Pensacola, Fla.) AFL construction workers are back. Terms of settlement of the 80-day strike over travel pay and wage differentials were not revealed.

EXPANSION

Polyethylene: Spencer Chemical Co. is building a polyethylene plant in Orange, Tex. (*CW, Mar.* 23). Estimated output: 45 million lbs./year. Initial production date: spring 1955. No DPA certificate has been issued to Spencer as yet, but ICI license for the project has been obtained.

•

Chlorine: The Army will make its chlorine plant at Muscle Shoals, Ala., available for lease to private industry around June 1. Any company leasing the plant, however, "will have to earmark part of its production for military use."

•

Sulfur: American Sulphur & Refining Co. is building its first commercial plant near Millmore, Calif. Due within the next five months, it will produce 100 tons of 99.5% purity sulfur per day. Investment: approximately $1 million.

•

Dacron: Du Pont's $40-million Kinston, N. C., dacron plant has started production. Annual goal: 35 million lbs./year.

As work started up at Kinston, Du Pont closed its Seaford, Del., experimental dacron unit, but continues operations with continuous filament yarn there until the new plant is ready to take over.

•

Latex: B. F. Goodrich Co. has started an expansion program to increase production of latex thread at its Akron plant "by several times the present rate." Cost: over $1 million.

•

Ammonia/ACN: American Cyanamid's $55-million plant, on the west bank of the Mississippi above New Orleans, is expected to be completed in early 1954. Initial products: ammonia, acetylene, sulfuric and hydrocyanic acids, ammonium sulfate and acrylonitrile.

•

Epichlorohydrin: Shell Chemical Co. has brought its epochlorohydrin plant at Houston on stream to net a threefold production increase.

Tied in with the expanded facilities is manufacture of epon resins, scheduled for production in substantial quantities when an epoxy resin plant is completed this fall. Also expected for fall production: a bis-phenol plant at the Houston site.

•

Alum: Allied Chemical & Dye's General Chemical Div. plant at Savannah has completed its $160,000 expansion to boost output of liquid alum.

Further expansion is now contemplated.

•

Pyrophyllite: United Feldspar & Minerals Co. plans to construct a pyrophyllite milling plant at Stem, N. C.

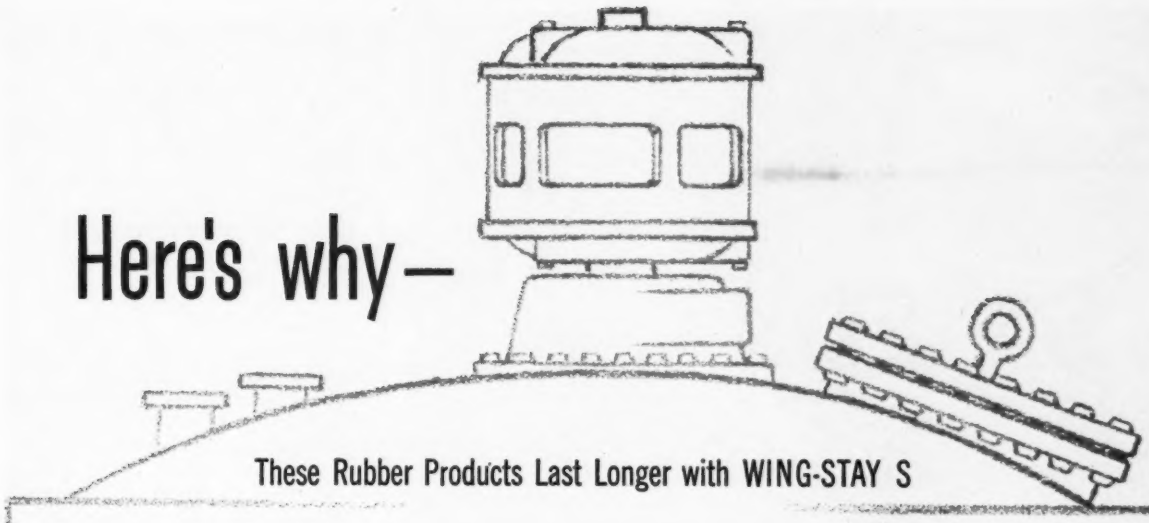
'Gravy Train' Denied

Take it from Jack Frye, president of General Aniline & Film Corp.: Companies bossed by private management no doubt have their share of trouble and woe, but their lot is an enviable one compared with the plight of a company operating on a lease held by the U. S. Government. A cross-section of the problems of a firm under government seizure can be seen in a resume of Frye's activities last week:

• Apparently concerned about morale of employees and stockholders, Frye told old-timers at GAF's plant in Rensselaer, N.Y., "chances are better than 50-50" that Congress will enact a law cutting the red tape that prevents the company from being returned to private management while litigation is pending (*CW, Feb.* 28).

• Worried about public opinion generally, Frye and General Manager

Here's why—



These Rubber Products Last Longer with WING-STAY S

WING-STAY S is an antioxidant for rubber. It is a liquid hydroxy compound which gives up hydrogen to "tie up" oxygen absorbed from the air. It effectively inhibits the hardening, stiffening, embrittlement and other changes in rubber caused by oxidation.

WING-STAY S is an outstanding antioxidant. It positively protects both natural and synthetic rubber – without staining or discoloration. It is unusually resistant to sunlight. It is virtually immune to water. It fully resists heat.

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two carloads of chemicals—*by the lining that rolled with the punch*

STEEL PACKAGING PROBLEM SOLVED BY INLAND LINING RESEARCH

Damaged shipments are bad news any time. They're especially bad to Emulsol Corporation of Chicago. This company produces a variety of chemical emulsifiers which must be protected against "iron contamination." They are often shipped in Inland steel containers with one of our exclusive protective linings.

Imagine the surprise of Emulsol engineers when, recently, they cut open some badly dented drums containing one of their chemical emulsifiers and found the product in perfect condition.

These shipments had received rough handling in transit. In "humping," one drum had apparently broken loose and forced others away from their shoring. Consecutive damage resulted as drum smashed drum. (One was dented as deep as ⅓ of the drum's diameter!) Yet for hundreds of miles of this banging and bumping, Inland's lining proved elastic enough to withstand punch after punch without breaking. The contents were *fully* protected!

According to Emulsol, "We're more than pleased with the job Inland linings do in protecting our emulsifiers."

Maybe Inland's lining research can help you as it has helped others to find new ways to protect products packaged in steel. We'll be glad to work with you to find the right lining and the right container for your products.

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B&I . . . . . .

James Forrestal of GAF's Ansco and Ozalid divisions spoke up in Binghampton, N.Y., to deny the charge made by a nationally syndicated columnist and radio commentator that recent price cuts on certain Ozalid products would result in losses that would have to be made up out of the U. S. Treasury.

Although GAF's annual report wasn't out yet, Frye and Forrestal assured the world that Ansco and Ozalid actually accounted for the bulk of the parent company's total profit for 1952.

• Anxious not to alienate the new Congress, Frye testified before a Senate subcommittee in Washington that GAF has not been "a super gravy train" for friends of the former Democratic administration.

Frye told the senators that annual salaries of GAF's seven top positions now totalled $216,500, compared to a sum of $420,993 just before the Justice Department seized the corporation in 1942 on grounds that it was a front for Germany's I. G. Farben. Frye said his pay is $97,000 and the next ranking company officers receive $75,000 and $45,000, respectively.

Frye explained two major difficulties in GAF's present status: the company isn't allowed to change its capital structure, and other companies are reluctant to enter into long-time contracts because of uncertainty as to GAF's ownership and management.

The bill Frey is plugging would allow GAF to be sold and the proceeds put in escrow until the Interhandel lawsuit is ended. What bothers the committee is this: would sale of GAF deprive nonalien stockholders—many of them U.S. citizens—of their rights?

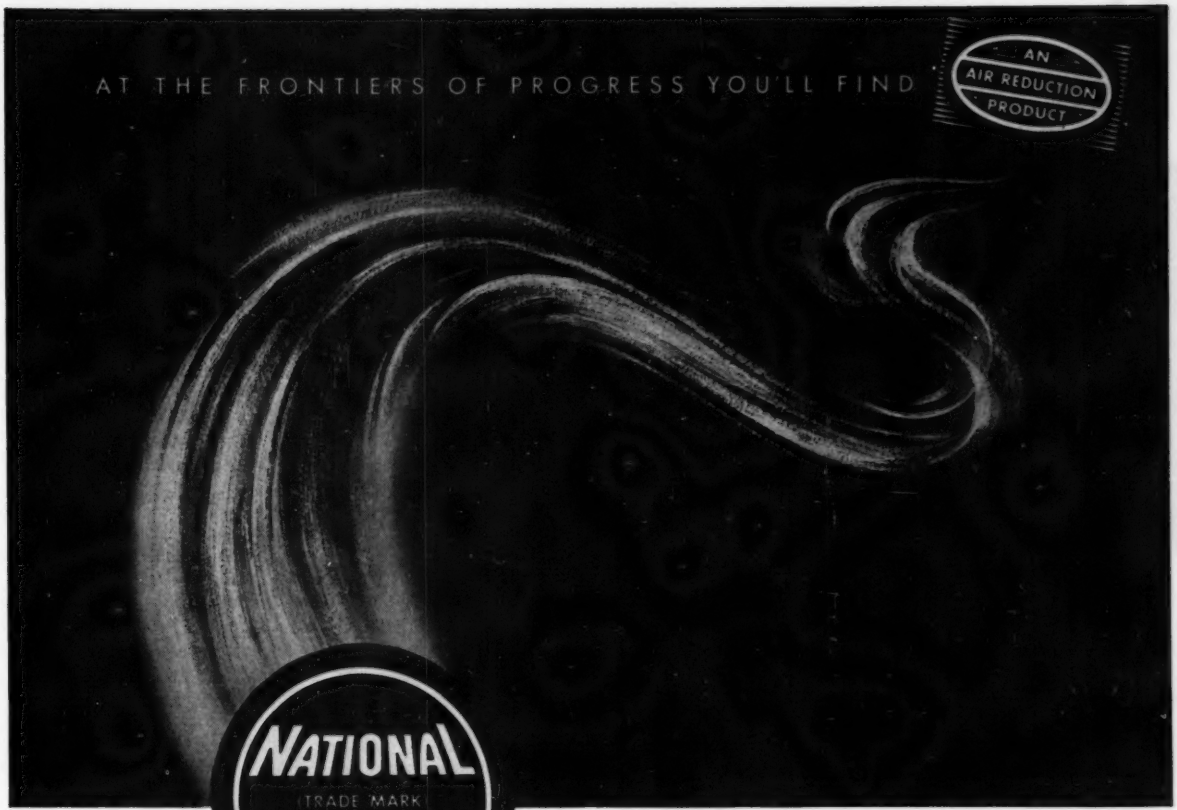
FOREIGN . . . . . .

Phosphates/South Africa: South Africa's £2-million government-sponsored phosphate factory at Palabora is expected to come into production about the middle of 1954. During initial output stages, production of about 56,000 tons of phosphate concentrates annually is sought. Eventual plans, however, call for boosting tonnage to 450,000 tons/year.

•

Pharmaceuticals/Egypt: Chemical Industries Development, S. A. E., Cairo, is reported to be seeking U.S. capital participation. Products now manufactured: sedatives, chlorophyll deodorants, barbiturates, and insecticides.

By an agreement with a U.S. company, CID repackages antibiotics, and



ACETYLENE...

where it stops nobody knows

Acetylene has zoomed to the fore as a keystone of modern chemistry. Chemical producers use acetylene in the production of vinyl chloride, vinyl ethers and vinyl acetate . . . pyridine derivatives . . . halogenated hydrocarbons . . . acrylonitrile . . . acetylenic alcohols and acetylenic glycols. These materials are then converted to end products as divergent as rayons and resins, medicines and plastics, synthetic fibers and rubber.

Where acetylene's usefulness leads — and where it stops — nobody knows.

National Carbide is one of the world's largest producers of calcium carbide and acetylene. Its newest plant at Calvert City, Kentucky, will be capable of turning out approximately 300,000 tons of calcium carbide yearly—the acetylene equivalent of which is around 2,700,000,000 cubic feet. Potential users can be supplied acetylene by pipeline at available adjacent properties. National Carbide also furnishes calcium carbide to chemical producers for generation into acetylene at their individual plants.

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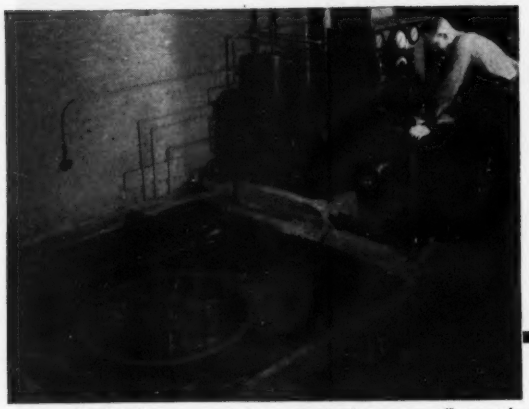
Why it costs more to build "Buffalo" FANS



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When you buy "Buffalo" Fans, Air Cleaning or Conditioning Equipment, you can be sure that you are getting the best that seventy-five years of experience can produce.

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distributes them under the American brand name.

•

Graphite/Germany: In a trade pact recently concluded between Ceylon and West Germany, Ceylon will be the latter's principal source of graphite.

•

Magnesium/Canada: Aluminum Co. of Canada has revealed that the 300% expansion of its magnesium-producing facilities at Arvida, Que., will be completed on schedule within the next two months. The $2-million project will bring Alcan's magnesium capacity to around 40% of the total Canadian capacity.

•

Dyes/Germany: The Allied High Commission in Bonn, Germany hopes to complete the dispersal of the I. G. Farben chemical trust assets by the first week in April. Three successor corporations have been awarded Farben's principal assets: Farb-Fabriken Bayer, Leverkusen; Farbwerke Hoechst, Frankfurt; and the Badische Aniline und Sodafabrik Corp., Ludwigshafen.

•

Superphosphates/Turkey: The Eti Bank, Ankara, Turkey is receiving bids for construction of a sulfuric acid plant at the Murgul copper smelter and a superphosphate plant at Hopa. Cost of the project is estimated at $8 million. Anticipated annual production: 156,000 tons of sulfuric acid; 46,000 tons of triple superphosphate.

KEY CHANGES . . .

Grayson Kirk: To board of directors, International Business Machines, New York, N.Y.

R. Wolcott Hooker: To a vice-president, Hooker Electrochemical Co., Niagara Falls, N.Y.

Robert E. Wilkin: To a vice-president and general sales manager, Hooker Electrochemical Co., Niagara Falls, N.Y.

Frank W. Dennis: To vice-president, industrial relations, Hooker Electrochemical Co., Niagara Falls, N.Y.

William H. Rand: From board of directors, Chemstrand Corp., to deputy director, Mutual Security Administration, Washington, D.C.

A. E. Post: To president, Chemical Process Co., San Francisco, Calif.

DIED . . . . . .

Emil C. Barell: Former international president of Hoffman-LaRoche & Co., Ltd., Basle, Switzerland.

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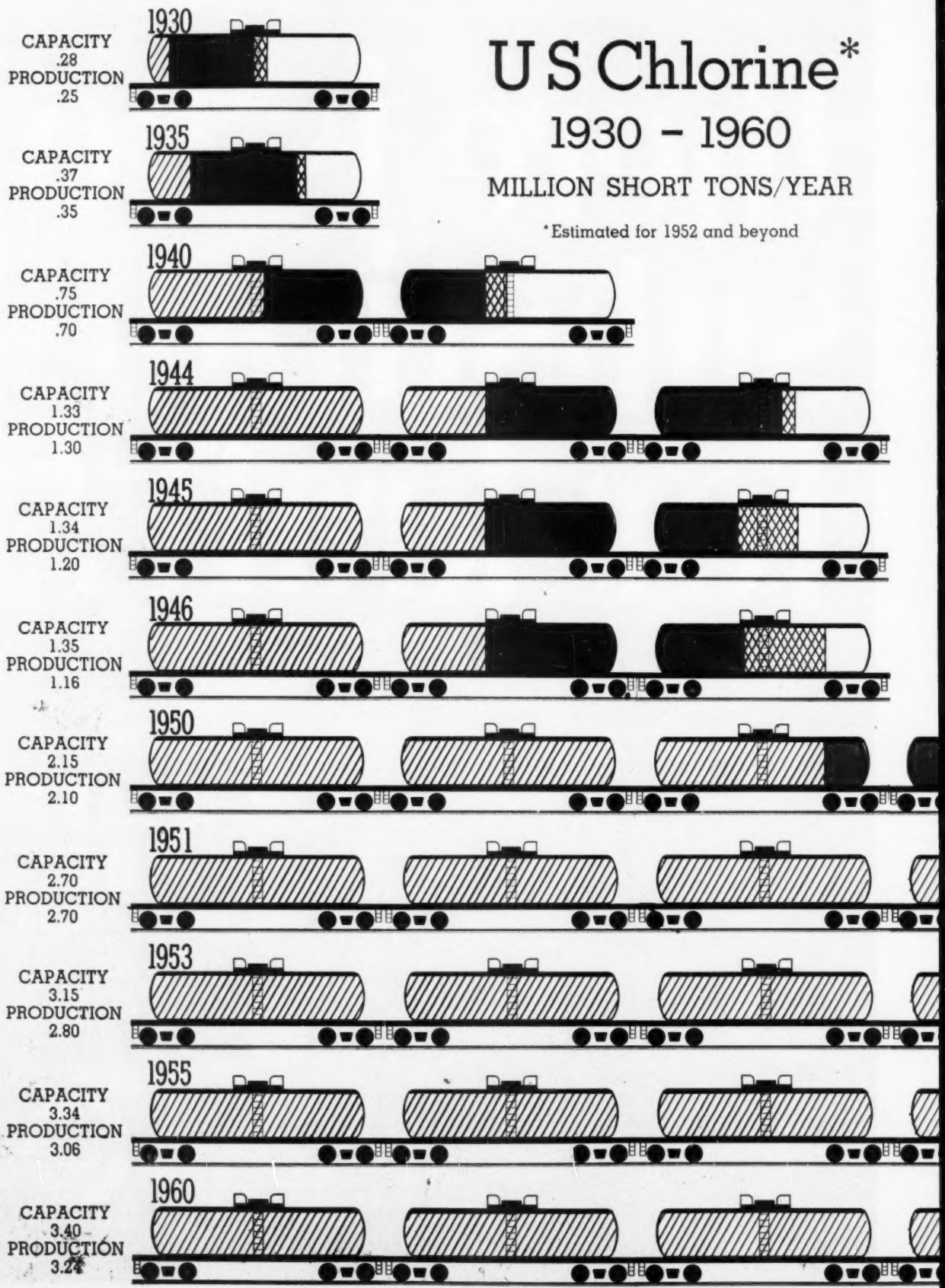
U S Chlorine*

1930 – 1960

MILLION SHORT TONS/YEAR

*Estimated for 1952 and beyond



C W Report

New Pattern for Chlor-Alkali

Electrolytic producers near completion of 50% post-Korea expansion that will mean ample chlorine and caustic capacity by 1954—3.5 million tons/year each. Trend to captive production continues.

Post-OPS price adjustments (in the making) will hike chlorine and soda ash moderately, help offset higher capital investment costs.

Chlorine without caustic, especially from by-product hydrogen chloride, and expansion of caustic outlets will help balanced growth.

by Joseph Gordon*

During the post-Korea period of defense preparation, the chlor-alkali industry has had three objectives:

- To expand chlorine supply to meet the demands of mobilization.
- To achieve a balanced growth between chlorine and caustic soda.
- To secure an equitable return on plant and equipment requiring an increasingly large capital investment.

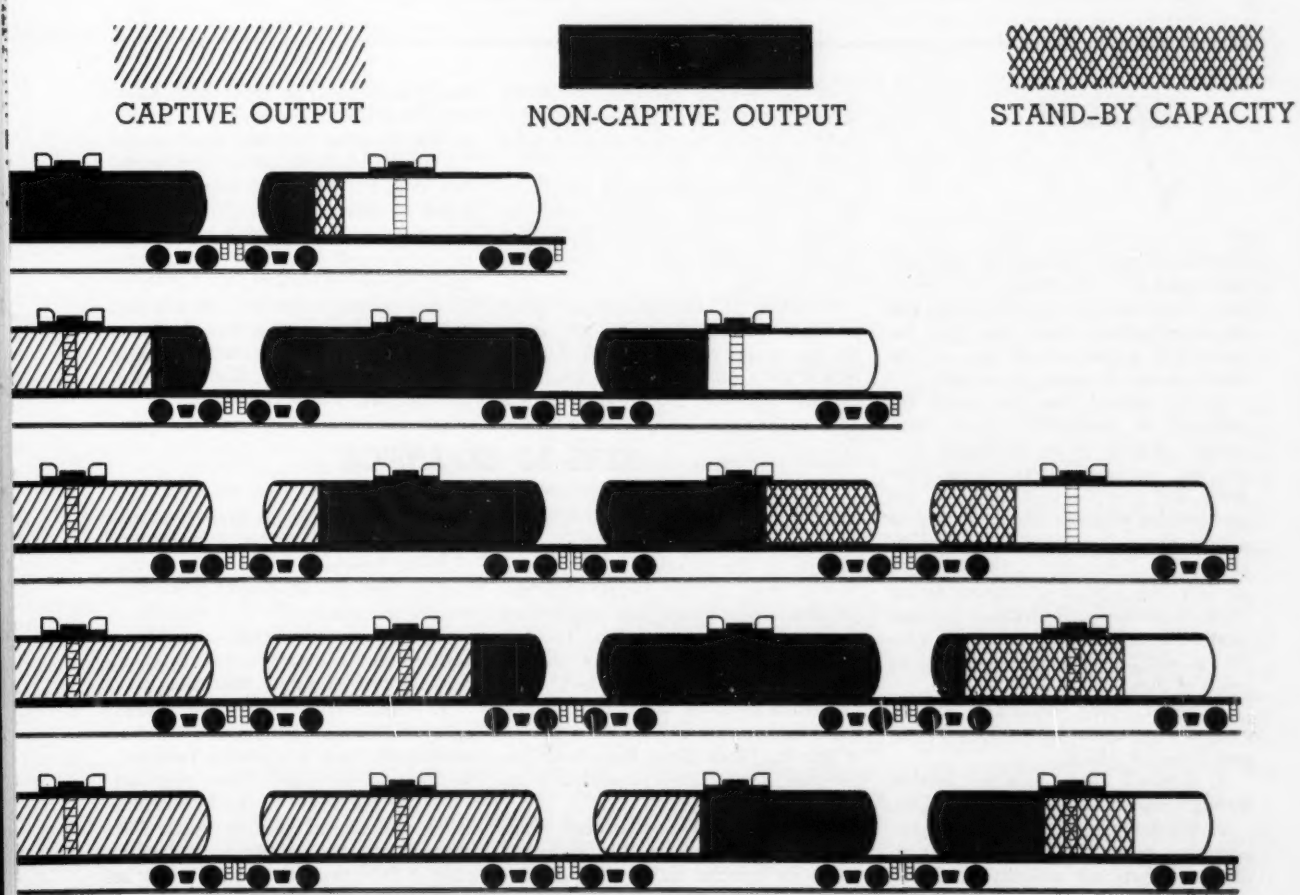
The industry, now well along in this expansion program, has already reached its first goal. The other two, though now closer to realization, are still ahead.

By the middle of 1954, annual capacity for chlorine and caustic will be approximately 3.5 million tons each. And soda ash, aiming at a 6-million-ton capacity by that date, is closely related to chlor-alkalis in that it competes with caustic for many markets and in that a portion of the nation's caustic is produced from it.

Such impressive totals—tonnage-wise the three are among the top five heavy chemicals—in themselves establish the industry's importance, but its rapid growth since Korea in the face of thorny and unique problems is no less impressive.

Basic to the problem of a balanced supply of chlorine and caustic is the fact that they are co-produced by the electrolysis of salt brine. For every ton of chlorine made this way, there is produced about 1.1 tons of caustic.

* Consultant in chemical economics and engineering, 545 Fifth Ave., New York 17, N.Y.



End Uses for Caustic & Soda Ash (1953)

Caustic Soda		Practically all ash		Soda Ash
Est. Production – 3.30 million tons				Est. Production – 5.78 million tons
		Glass		1,723,000
		Caustic & Bicarbonates		688,000
		Water Treatment		192,000
		Both Important		
882,000		Other Chemicals		1,433,000
197,000		Soap		202,000
207,500		Other cleaners		173,000
240,000		Pulp & Paper		352,000
58,500		Metals Processing		387,000
374,000		Exports & Miscellaneous		630.000
		Practically all caustic		
781,000		Rayon & Film		
284,000		Petroleum refining		
178,400		Textile processing		
48,800		Vegetable oil refining		
48,800		Reclaimed rubber		
TOTAL 3,300,000 tons				TOTAL 5,780,000 tons

C W Report

Obviously there would be no problem if demand for both products stayed in step. This, however, is frequently not the case, and the result has been intermittent surplusses of one or the other—in recent years, of caustic.

At the present time, the supply adjustment is reasonably good, with caustic tending to be in longish supply but not excessively so in most areas. But over the past ten years, the demand for chlorine has increased at a rate more than double that of its co-product. From the long-range point of view, this type of divergence seems likely to continue. If chlorine demand continues to outgrow caustic's, producers will have to decide on one or more of these moves:

1. Make more chlorine without caustic—*e.g.*, from by-product hydrogen chloride (HCl).

2. Expand the caustic market through research and sales promotion.

3. Work for a price adjustment permitting a relatively greater return on chlorine than on caustic. A lower price for caustic presumably would increase its use in markets where it is technologically interchangeable with other alkalis.

Each of these proposals has come in for increasing attention and appraisal, and each is likely to play a part in eventually resolving the industry's dilemma.

Solution of the industry's other problem—securing a sufficient return on the huge capital investment required for a plant—has been made especially difficult by price controls which have been in effect since January, 1951. Producers have been caught in the squeeze between fixed prices for their products and rising costs. But with the lifting of price controls relief is now possible. First sign of new price relationships in alkalis appeared several weeks ago when some producers scheduled May 1 boosts of 15 and 20 cents/100 lbs. for ash and chlorine. It now seems that the chlorine raise won't go into effect for some time (*CW, Mar. 28*), but that the ash hike will stick.

KEYS TO EXPANSION

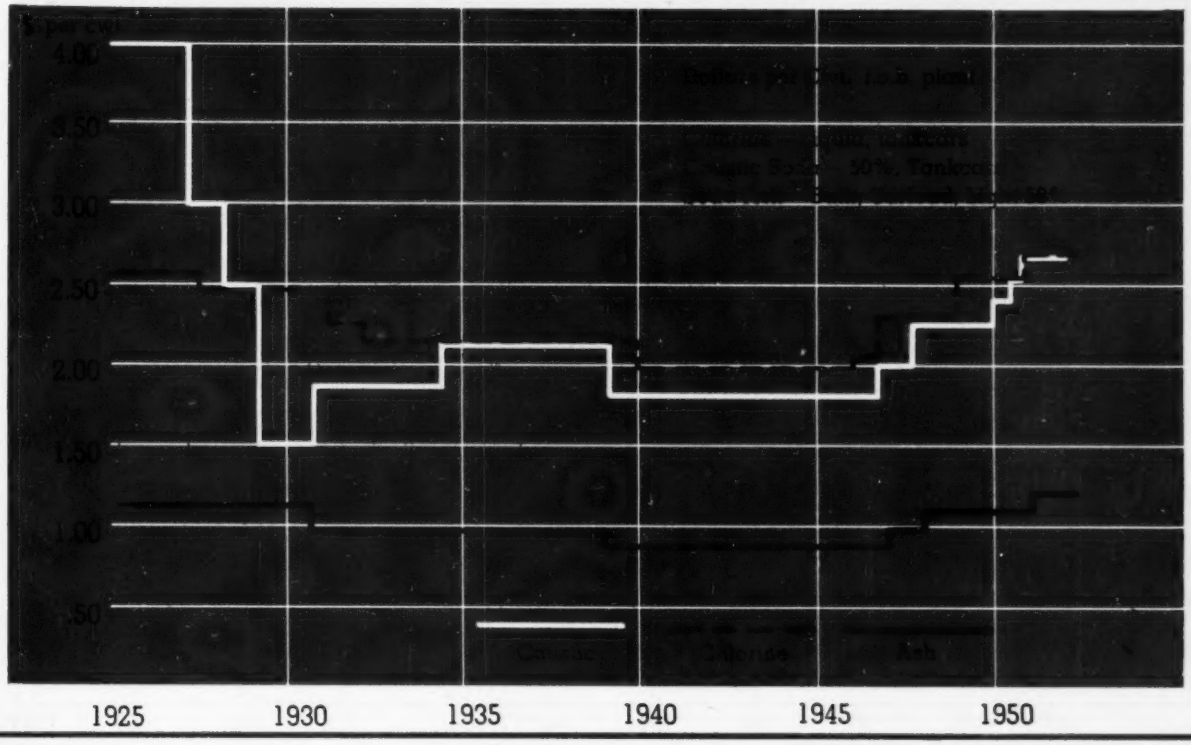
Although the prospect of growth and the problems it would bring have loomed on the chemical horizon since World War II, the tremendous expansion since Korea has accelerated the former and accentuated the latter. By the summer of 1954, the industry will have undergone a 50% expansion entailing an outlay of some $250 million—all this within a period of less than four years. Even now this program is more than two-thirds complete.

Most of this expansion has been geared to the present and expected needs for chlorine rather than the demand for caustic. Consequently in undertaking to meet the demand for chlorine, producers also took on the task of profitably disposing of a rising supply of caustic.

There were at least four compelling considerations that fostered this expansion of electrolytic facilities:

1. Accelerated amortization allowed by the Defense Production Administration on most post-Korea facilities. In the case of chlor-alkalis, this has averaged some 50% of the investment to be written off in five years. For many chlorine-caustic producers, caught for more than two years in

Chlorine–Alkali Price Trends (1925-1952)



the squeeze between rising costs and OPS-controlled price ceilings, this was a necessary prelude to expansion.

2. The belief that if one did not expand during this period, the possibility of future expansion would be less attractive. In a competitive field like chlor-alkalis, characterized as it is by huge tonnages and low price levels, one who hesitates might well find at a future date that desirable plant locations and markets for products have been pre-empted.

3. Confidence in a healthy growth in chlorine demand and the possibility of widening the caustic market.

4. Expectation of an early end of government price controls, leaving the way open for prices governed by supply and demand. This hope has now been realized and some producers will be able to get higher prices for chlorine and ash.

Rule of Price: The close interweaving of cost, price and product demand is sometimes not readily apparent to those outside the industry. Chlorine, caustic and soda ash are among the lowest priced chemicals on the market, and are characterized by unusual price stability. In trying to maintain these levels, the chlor-alkali industry has to make a constant effort to reduce operating costs in the face of the increasing capital investment required per ton of product. For chlorine, the investment is now $8-12,000 per ton of capacity per day, depending on the size of the plant — approximately double the pre-World War II capital requirements. This leads to continued improvement in technology and to emphasis on plant locations which involve minimum total expense for salt, power and shipping products to markets.

The same considerations influence the ammonia-soda producers of soda ash, an alkali cheaper than caustic, and one used in substantially larger volume. Between these two alkalis, a dual relationship now exists. Via the lime-soda process, ash accounts for a significant, though decreasing, portion —about 17%—of the total caustic output. In addition, there is a latent competition between them since for many uses they are in large part technologically interchangeable.

Alkali vs. Alkali: Whether this is also economically feasible depends upon the price differential. For most uses in this country, ash is sold in bulk and caustic as a 50% solution, but on a 100% basis. Prior to the boost just scheduled for ash, the differential between them, f.o.b. plant, has been about $28/ton: ash has

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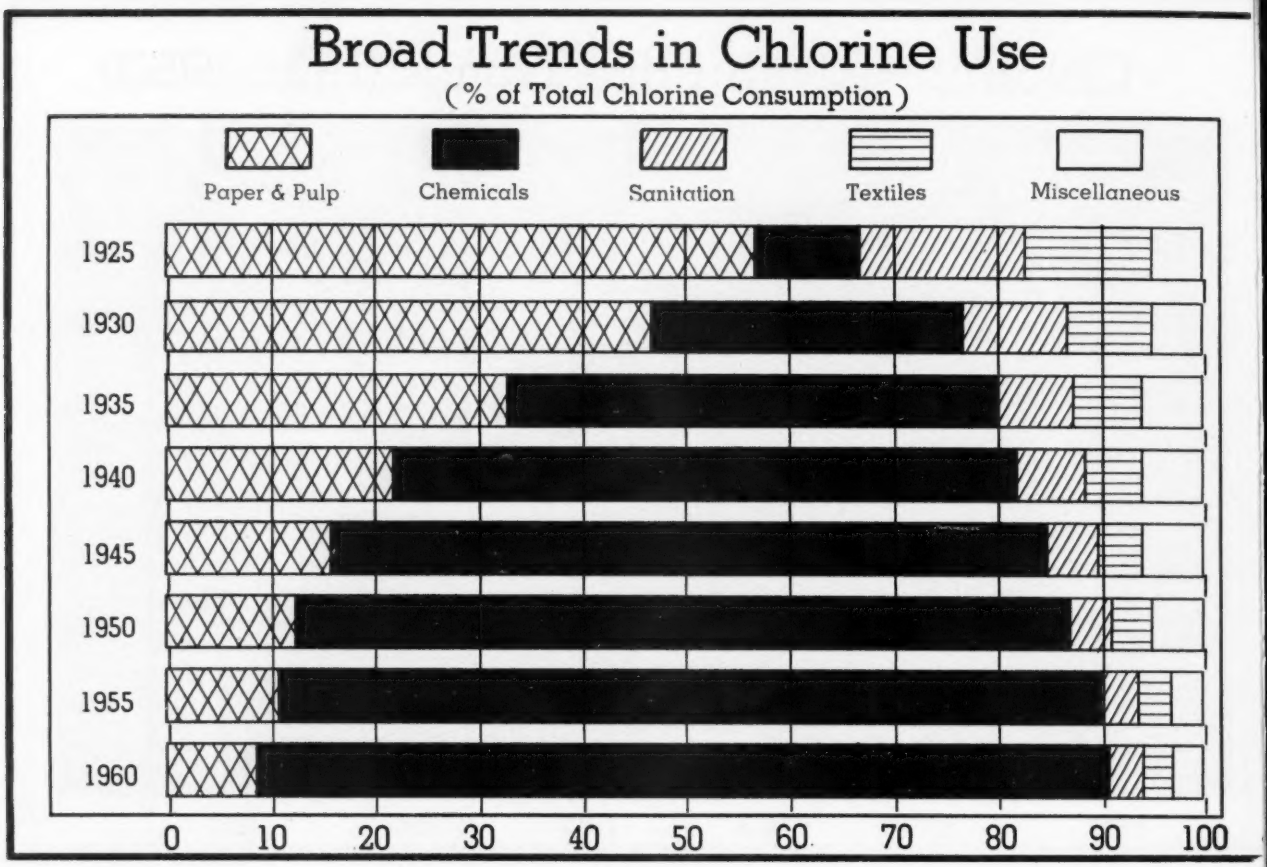
been selling at $24/ton; the 50% caustic solution, 100% basis, about $52. Figured on the sodium oxide (Na_2O) content—the actual standard for most uses—the differential has been approximately $21/ton, still a substantial margin in favor of ash.

The margin may be further reduced in the next year or two, less because of a softening in caustic than because of the pressure of higher costs upon the ammonia-soda producers who account for about 90% of the total ash output*. It is significant that no major additions to ammonia-soda ash capacity have been made since the 1930's. However, a two-year rebuilding program by Solvay Process at Baton Rouge, La., and at Syracuse, N.Y., is nearing completion. The construction at Syracuse will in effect replace the older facilities with a practically new plant, having

* The remainder comes from natural deposits in California and, more recently, from the trona deposits near Green River, Wyo.



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perhaps 10% more capacity than the old unit.

A present day ammonia-soda plant, built from the ground up, represents an outlay of at least $20,000 per ton of ash per day, more than double that required 15 years ago. The main reason that ammonia-soda producers can operate with reasonable return at present price levels, is that these older plants are almost completely amortized.

The high cost of putting up new facilities has led to a virtual halt in ammonia-soda process expansion. Prior to any further expansion, these producers require some kind of economic incentive—a price increase or tax abatement in some form. Since DPA has not authorized the latter, the key to further sizable expansion in ammonia-soda will be higher prices for the product.

In view of the steady growth in ash demand, an upward trend in ash prices seems probable; and this will narrow the ash-caustic price differential. Such a change in price structure should in turn stimulate a moderate increase in caustic use. But a more immediate result to be looked for is a hastening of the shutdown of facilities used to make caustic out of ash by the lime-soda route. The end result—a larger ash supply and a smaller supply of caustic—should help improve the caustic-chlorine balance.

By and For Chlorine: Weighing these prospects since long before Korea, ammonia-soda producers have gone into electrolytic caustic and chlorine. And they have participated along with other electrolytic producers in the present push for more chlorine capacity. (Table on p. 38 lists leading chlorine producers with their estimated 1954 plant capacities.)

Most of the drive for chlorine—and chlorine's growth—has been due to the meteoric rise in demand for a multitude of chlorine-based products, chiefly organic chemicals. Some of the more important include solvents like trichlorethylene and perchlorethylene; refrigerants and aerosol propellents such as the Freons, Genetrons and methyl chloride; large-volume plastics like vinyl chloride and vinylidene chloride, and special ones like Kel-F; a family of chlorinated insecticides such as DDT, BHC, toxaphene and others of smaller but fast-growing volume.

Figure above shows how this manufacture of chemical products has been the highlight of the six-fold surge in chlorine demand since 1939. Confronted by that demand and guided by economic necessity, producers have increasingly made their production captive by going into the manufacture of derivatives rather than continuing to sell chlorine at the prevailing slim margins of profit. Such efforts to "upgrade" chlorine have enabled producers to diversify for better integration and production balance. How pronounced this trend is, is readily apparent from the increase in captive chlorine: today about 70% of chlorine produced is captive as against some 33% in 1939. (*See graph p. 28.*)

EXPANSION ROUNDUP

Almost every producer has swung over to this captive policy, largely a post-war development that has been gathering momentum ever since. Dow Chemical, by far the largest producer, for example, reserves the great bulk of its output for its own use. This is particularly true of its mammoth Freeport-Velasco facilities on the Texas Gulf Coast. There Dow has been up-

Chlorine Growth in Organic End Products

(Est. 1940-1960)	1940		1945		1950		1955		1960	
(millions lbs. and % total)	lbs.	%	lbs.	%	lbs.	%	lbs.	%	lbs.	%
Solvents	350	45.5	528	35	760	27	1,160	25.1	1,740	24.2
Refrigerants & Propellents	154	20	241	16	365	13	517	11.2	790	10.9
Automotive Fluids	77	10	196	13	421	15	651	14.1	965	13.4
Plastics & Fibers	68	7.5	166	11	365	13	698	15.1	1,280	17.8
Pesticides & Herbicides	15	2	122	8	379	13.5	707	15.3	1,015	14.1
Misc.	106	15	257	17	520	18.5	887	19.2	1,410	19.6
	770	100	1,510	100	2,810	100	4,620	100	7,200	100

ping its chlorine output for vinyl chloride, perchlorethylene, ethylene dichloride, ethylene oxide-glycol, and other products. Dow's expansions at Midland, Mich. and Pittsburg, Calif.—on a smaller scale and for similar products—are on the same basis. When the present program is completed in 1954, Dow's manifold and far-flung chlorine operations will account for about 20% of the nation's total chlorine output.

Second in chlorine production and top chlorine seller is Columbia-Southern Chemical, a subsidiary of Pittsburgh Plate Glass. By early next year, the C-S capacity will reach an estimated 1,300 tons of chlorine daily; its four plants at Corpus Christi, Tex.; Lake Charles, La.; Barberton, O.; and Natrium, W. Va. will contribute to this total. In sharp contrast to Dow, C-S sells the majority of its production, with a large part of this merchant chlorine moving by water in special 175-ft. barges built by the Dravo Corp. C-S is also an important soda ash producer, turning out ash by the ammonia-soda process at Barberton and Corpus Christi, and natural ash from the Trona-Searles Lake deposits in California.

The remaining ammonia-soda processors all rate high as chlorine producers. Diamond Alkali is probably third with an estimated capacity of about 700 tons/day by early 1954, largely captive. Diamond has been expanding and diversifying at a rapid pace since 1948 when it completed its electrolytic plant at Pasadena, Tex., adjacent to Shell Chemical. The company is under contract to supply Shell's chlorine requirements for synthetic glycerine and other chlorinated organics. In the summer of 1951, the company also became a factor in insecticides through acquisition of Kolker Chemical which has a plant across the channel from the parent company at Pasadena, another in Newark, N.J. Next step in Diamond's expansion program at Pasadena will make it an important producer of vinyl chloride as well as other chlorinated organics.

Among those next in importance as chlorine producers is Solvay, the leading ash manufacturer. Its chlorine too is essentially captive since much of it goes to other Allied Chemical divisions. Solvay, incidentally, to date has been the only commercial producer to make chlorine without caustic. At its Hopewell, Va., plant (chlorine capacity of which has recently been expanded), salt is treated with nitric acid to make chlorine, sodium nitrate and nitrosyl chloride. The other three Solvay plants —at Moundsville, W. Va. (new), Syracuse, N.Y. (new), and Baton Rouge, La. (older)—are electrolytic.

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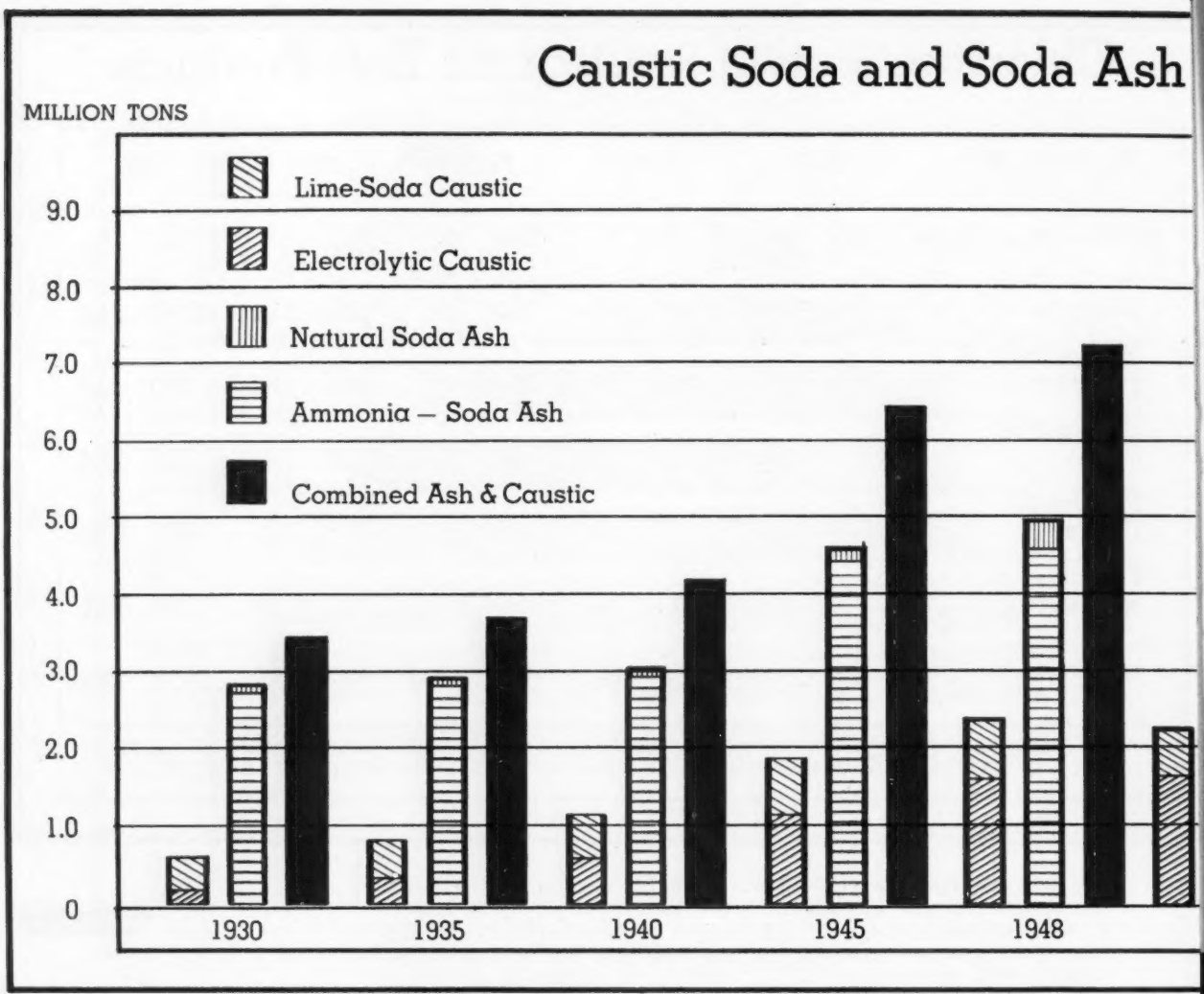
In the classification with Solvay as chlorine producers is a foursome comprising Hooker Electrochemical, Wyandotte, Pennsalt and Mathieson. They will have a capacity of 400-500 tons/day each within a year's time. All of these too have launched extensive diversifications into chlorinated organics.

With Hooker and Pennsalt, this diversification trend began shortly after World War II, and has quickened in the past three years. During this period, Hooker joined with Detrex Chemicals in the Hooker-Detrex large-scale solvents venture, and Pennsalt acquired Sharples Chemicals, an established organics producer. The diversification of Wyandotte and Mathieson, has made both factors in glycols and insecticides and other chlorinated products.

Among other companies important as chlorine producers are Stauffer Chemical, with plants at Henderson, Nev. and Niagara Falls, N.Y.; West-



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vaco, chiefly supplying Carbide and Carbon Chemicals under long-term contract; Monsanto, whose activity is focussed on numerous chlorinated organics; and Niagara Alkali, one of the Niagara Falls pioneers, making solvents and several other chlorinated products.

Three firms electrolyze molten salt, making chlorine with sodium rather than caustic as co-product. They are Ethyl Corp., Du Pont, and National Distillers. Most of their sodium output goes into the manufacture of tetraethyl lead, although much of National Distillers' chlorine at Ashtabula, O., is sold to nearby Hooker-Detrex for chlorinated solvents.

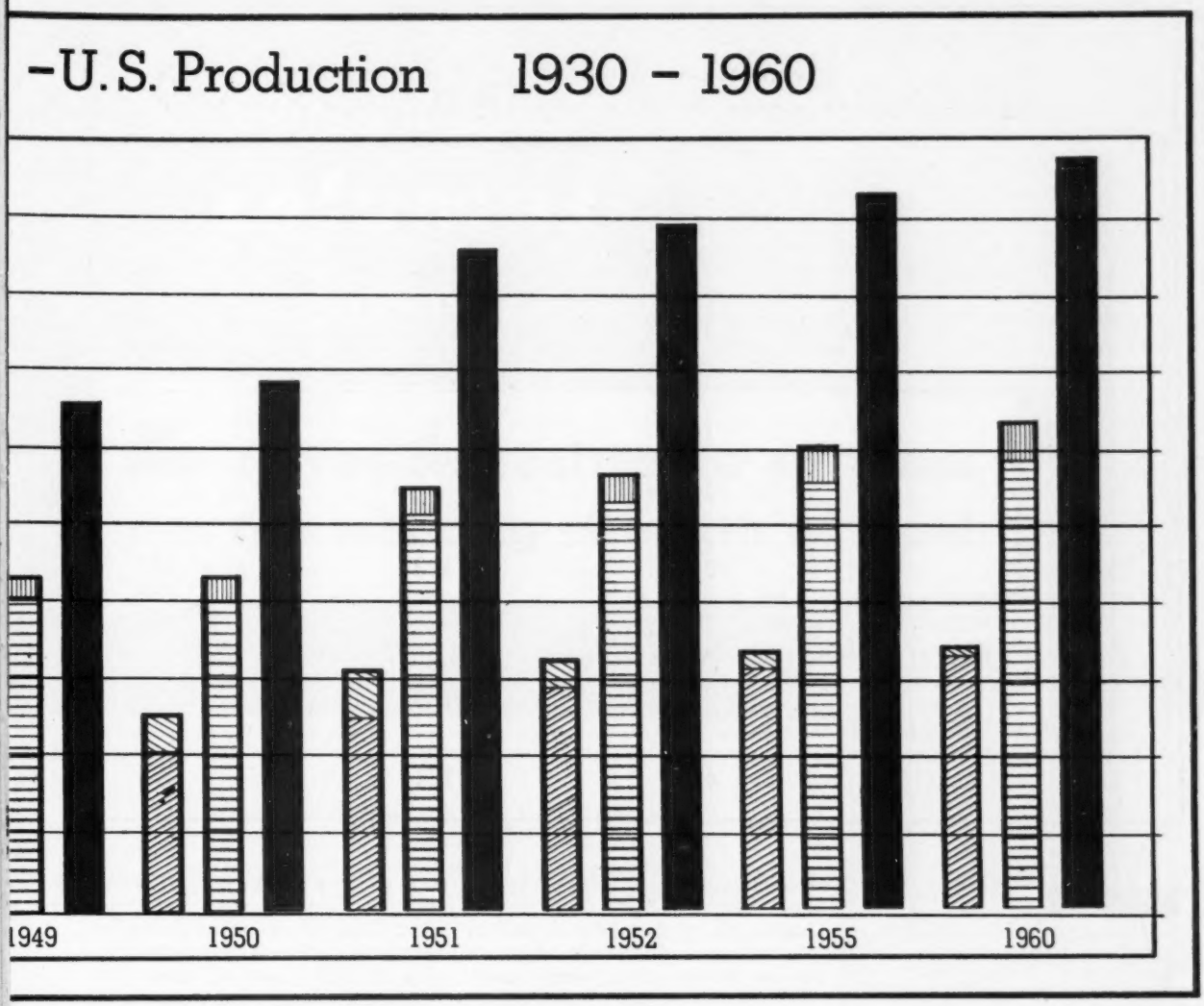
Mercury Cell Swing: In addition to expansion and diversification, the industry is undergoing other changes. One of the most significant is the increasing use of mercury cells which produce high-strength (about 72%), high-purity caustic directly. This product is cheaper to ship, and most important, is of purity suitable for making viscose. When current expansion is complete, mercury cells will account for over 10% of the electrolytic total, diaphragm cells the remainder.

Geographically the new plants and increased capacities are widely distributed, with the production center of gravity moving South and Westward. The Niagara Falls area, long dominant as a producing point, has been falling behind in recent years because of the shortage of, and rising rates for power there, and because of shifting markets. Major producing gains are being registered in the Texas-Louisiana area, in Virginia and West Virginia.

Three plants with capacities of nearly 100 tons/day that have been completed or will be completed this year illustrate the shift to new locations: Hooker at Montague, Mich.; Pennsalt at Calvert City, Ky.; and Mathieson at McIntosh, Ala. Substantial Western expansions in progress include Hooker at Tacoma, Wash.; Pennsalt at Tacoma and Portland, Ore.; Dow at Pittsburg, Cal. and Stauffer at Henderson, Nev.

Pulp and paper mills, aided by DPA certificates, have been active in boosting their electrolytic capacities or installing new facilities to meet their caustic and chlorine requirements for pulping and bleaching. These cells, of 10-25 tons/day capacity, now account for about 10% of all chlorine output. For such plants, the feasibility of manufacturing vs. buying caustic and chlorine varies with plant size, kind of pulping and distance from suppliers. In the Pacific Northwest, most mills find it cheaper to buy from Hooker and Pennsalt; in other sections, mills will often make their own, especially where long hauls are involved.

Some other important chlorine customers, among them Goodrich, Shell



and Hercules, have shown increasing interest in making chlorine themselves. Goodrich may produce chlorine for vinyl chloride, in which it is a leading factor; Shell has acquired the Julius Hyman insecticide business and its lease on the former Rocky Mt. Arsenal (including chlorine facilities) at Denver; Hercules, which buys chlorine for its toxaphene plant at Brunswick Ga., will soon make chlorine from its by-product HCl. Many will be watching this last move, for Hercules has licensed a modified Deacon process, devised by Grosvenor-Miller and further improved by Dow, and its success will point to one way out of the chlorine-caustic dilemma.

WHAT'S AHEAD

With several important new expansions slated to come into operation later this year, it is likely that the pattern for the future has been set. Upcoming capacity will keep pace with demand through most of the next year, and no major expansion in electrolytic facilities is looked for before that time.

One important factor bearing on the supply situation in the near future is whether the Army decides on full operation of its new deNora mercury cell installation at Muscle Shoals, Ala. The plant, operated by Monsanto, is running at about half capacity, and chances are it will not run at full capacity unless military needs rise or total chlorine demand increases sharply.

Outlook for Chlorine: From all indications, chlorine rate of growth will remain well ahead of caustic's for the next ten years. An annual increase of about 8.5-9% seems likely, sizable but more modest than the 13% annual increase since 1939 when many chlorine derivatives were new and their fields of application less competitive.

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Here are the major organic end products that will determine chlorine consumption over the next decade:

Plastics: This is the fastest growing group and in terms of volume, the vinyls—vinyl chloride and vinylidene chloride—will continue to predominate. Output now runs nearly 450 million lbs./year, and the growth rate over the next five years should be about the same as the last five. Vinyls for floor tile and fabricated shapes of PVC should contribute much to this growth; others have promise in synthetic fibers, packaging and metal linings.

Chlorine use will also be bolstered by the increased use of phenolics especially for foundry shell molds, and

Hydrogen Chloride Output (1935-1960)

Thousand Tons/Year

	Total	By Product	Chlorine & Hydrogen	Salt & Acid
1935	60	11	9	39
1940	175	35	22	97
1945	408	120	60	160
46	345	90	58	158
47	443	185		
1950	615	342	113	167
51	694	393		173
52	681	380		160
1955	723	428	160	159
1960	750	478	182	155

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for the bonding of wood waste. However, since phenol is also derived from non-chlorine-using processes, chlorine gains will be limited to the extent that chlorine-using methods are employed.

Similarly, the boom in ethylene glycol-terephthalates and acrylonitrile for synthetic fibers will mean more chlorine only where chlorhydrin manufacturing processes are used to make ethylene oxide.

Rapid growth for special chlorinated plastics such as Kel-F is considered a sure bet. And swiftly rising silicones and butyl rubber reflect in turn a much greater need for methyl chloride. Annual capacity for this product has nearly doubled since early 1951 to meet DPA's goal of 72 million lbs. by the end of 1954.

Refrigerants and Propellents. About 10% of methyl chloride production will be used for refrigeration purposes, but here the products to watch are Du Pont's Freons and General Chemical's Genetrons, a series of chlorofluoro-organics. Their chlorine content originates mostly from carbon tet and chloroform. Both as refrigerants and as aerosol propellents these product families should do nearly as well in the next few years as they have up to now. However, as a group, increases in chlorine requirements will probably be moderate.

Solvents and Paint Removers: This represents the largest chlorine-consuming group of organic products, and should maintain that position for at least the next 10 years. Carbon tet, which to a large extent is being supplanted by perchlorethylene for dry cleaning, is still an important solvent but is moving toward more chemical applications.

Production capacity for perchlorethylene should be some 180 million lbs. annually about one year hence. By that time capacity for trichlorethylene should approach 400 million lbs./year, making it the leading solvent among chlorinated organics. Metal vapor degreasing demand should continue to insure its rapid growth rate.

A faster climb is under way for methylene chloride, the end of next year culminating a slated 180% capacity boost in a four-year period. Much of this, however, has been defense-inspired for "de-mothballing" applications and paint removers.

Automotive Fluids: Both TEL and ethylene glycol have been tied to the demands of the automotive engine for anti-knock additives and anti-freeze over the past 20 years. And aviation gasoline has been a big consumer of TEL. TEL fluid contains or requires in its manufacture ethyl chloride, ethylene dichloride and ethylene dibromide, all important chlorine consumers. And glycol is made from ethylene oxide which in the chlorhydrin process requires chlorine. Together TEL and ethylene glycol now account for some 1,000 tons of chlorine daily.

The future growth of these products will reflect a somewhat moderate increase in chlorine demand. In the case of TEL, conflicting trends are in evidence. On the favorable side are the greater number of vehicles and high compression engines; however, increased usage of aromatics or the shift toward jet engines will partly offset this. DPA's goal for TEL capacity by the first of 1955 is 570 million lbs./year, a 4-year boost of 150 million lbs.

Prospects for growth of ethylene glycol are good, with an increasing trend toward diversification in outlets other than anti-freeze, which in the past few years accounted for over

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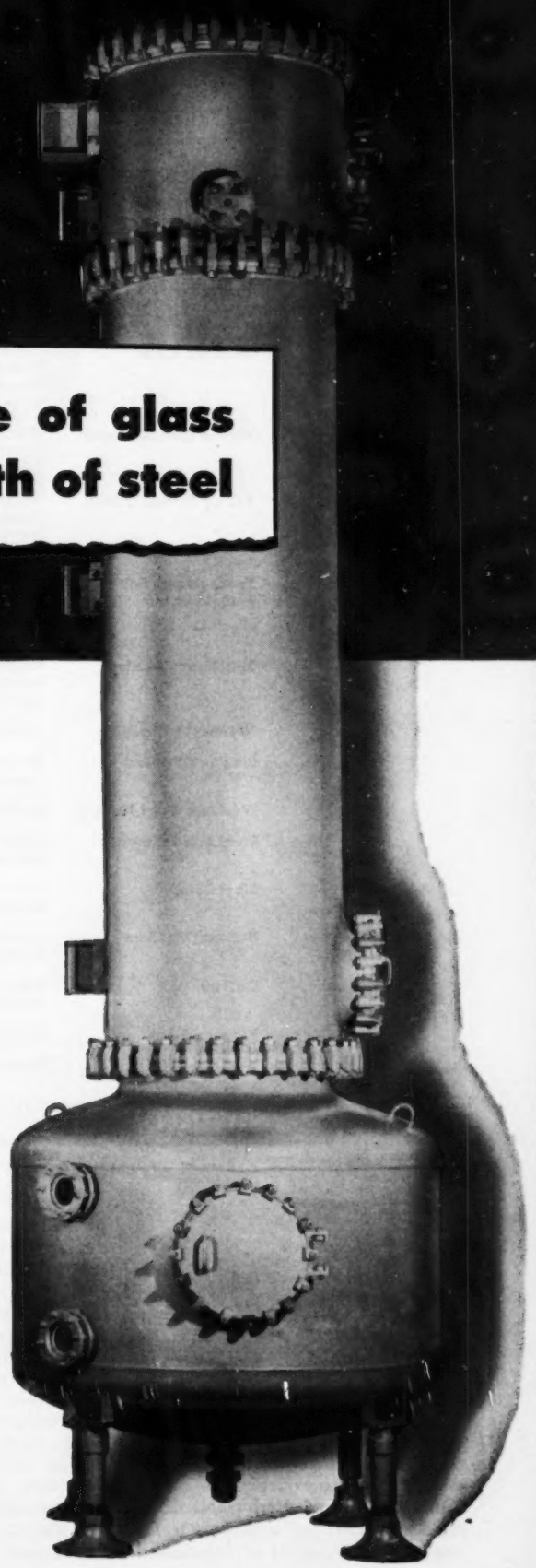

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Leading U. S. Private Chlorine Producers and Estimated Plant Capacities

(Capacity 100 tons/day or more)

Producer	Plant Locations	Individual Plant Capacities (by mid-1954)	Totals (tons/day)
Dow Chemical Co.	Midland, Mich.	525	
	Freeport-Velasco, Tex.	1450	2180
	Pittsburg, Calif.	205	
Columbia-Southern (Pittsburgh Plate)	Lake Charles, La.	400	
	Corpus Christi, Tex.	225	
	Natrium, W. Va.	450	
	Barberton, Ohio	235	1310
Diamond Alkali	Pasadena, Tex.	425	
	Painesville, Ohio	160	
	*Pine Bluff, Ark.	70	725
	*Edgewood Arsenal, Md.	70	
Hooker Electrochemical	Niagara Falls, N. Y.	225	
	Tacoma, Wash.	180	
	Montague, Mich.	100	505
Solvay Process (Allied)	Syracuse, N. Y.	155	
	Moundsville, W. Va.	175	
	Baton Rouge, La.	75	
	Hopewell, Va.	75	480
Pennsylvania Salt Manufacturing	Wyandotte, Mich.	225	
	Tacoma, Wash.	100	
	Portland, Ore.	85	485
	Calvert City, Ky.	75	
Mathieson Chemical	Niagara Falls, N. Y.	120	
	Saltville, Va.	225	455
	McIntosh, Ala.	110	
Wyandotte Chemical	Wyandotte, Mich.	450	450
Stauffer Chemical	Niagara Falls, N. Y.	125	
	Henderson, Nev.	275	400
Westvaco (Food Mach'y)	S. Charleston, W. Va.	375	375
Monsanto Chemical	E. St. Louis, Ill.	175	
	Anniston, Ala.	25	200
Ethyl Corp.	Baton Rouge, La.	120	
	Houston, Tex.	75	195
National Distillers	Ashtabula, Ohio	75	
	*Huntsville, Ala.	100	175
Du Pont	Niagara Falls, N. Y.	120	
	Deepwater Point, N. J.	25	145
Niagara Alkali	Niagara Falls, N. Y.	125	125
Shell Chemical	*Denver, Colo.	100	100
			8305

*Leased from government

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70% of the glycol produced. Chlorine's share in this glycol growth, however, will not keep pace because of the trend toward direct oxidation of ethylene rather than chlorhydrin processes to make ethylene oxide.

Insecticides and Herbicides. Compared with past performance, the future growth prospects of chlorinated pesticides seem less glowing. This is due in part to the spectacular success in recent years of the big three (BHC, DDT and toxaphene) and others like chlordane, dieldrin, aldrin, and methoxychlor—which will be hard to match. Moreover, any increase in chlorine requirements of this field will be modified by (1) the problem of insect resistance to chlorinated insecticides and (2) competition among chlorinated insecticides themselves and with those requiring no chlorine in their manufacture. Fastest growing is high gamma BHC, especially lindane, the virtually 100% gamma material.

Herbicides based on 2,4-D and 2,4,5-T salts and esters should do at least as well as they have since World War II. A few products such as pentachlorphenol derivatives—mainly used for wood preservation—should improve on their past growth record. However, the entire group of herbicides and pesticides is not expected to show a rate of anuual increase exceeding 8% for the next decade.

Role of HCl: In producing these large quantities of chlorinated organics, producers also end up with tremendous quantities of by-product hydrogen chloride. About 60% of the

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HCl produced in this country is made this way, and the amounts available from chlorination operations are so great that their utilization will help determine the future of chlorine. For HCl, once a by-product that presented serious disposal problems, no longer lacks for uses. Moreover, some of these applications are potential bridles on chlorine expansion. Evidence of this can be seen in instances like the following:

1. The Raschig process to make phenol with benzene, HCl and air (or oxygen) has come into greater use since World War II. It offers competition to direct chlorination of benzene.

2. Manufacture of ethyl chloride from ethylene and HCl, and vinyl chloride from acetylene and HCl compete with corresponding chlorinations. However, most of the HCl used in such processes currently comes directly from chlorine and hydrogen rather than from by-product HCl; hence such manufacture is primarily a potential rather than an actual rival.

3. Conversion of by-product HCl to chlorine. This is what Hercules will be doing at its Brunswick, Ga., toxaphene plant.

Sell vs. Use: The extent to which by-product HCl is so utilized is largely a matter of economics. Within the past five years, markets have been appreciably extended both in size and range. HCl is now generally shipped in rubber-lined tanks and barges farther and at considerably less cost than before. Because of this and the expansion of new uses, HCl sales have been mounting, and in many locations HCl disposal is no longer a problem.

One of the more important of the non-chemical uses is the acidizing of oil wells in limestone formations, mostly pioneered by Dow, and now a target for others in the Southwest who have by-product HCl available. Reduced shipping costs also have increased its use in pickling of metals, sugar refining, descaling of boilers, manufacture of silica gel, and others.

Whether a producer with by-product HCl decides to utilize it chemically or sell it for such industrial purposes, depends largely on the amount available, and the distance from markets. A chlorine buyer, for his part, naturally compares the cost with that of chlorine delivered to his plant. On the average, less than 20 tons/day of HCl would not be feasible for conversion to chlorine. Hercules at its toxaphene plant at Brunswick, Ga., which buys chlorine, figures to convert 35 tons/day HCl to chlorine. Interest in this test case is high, and if it fulfills expectations, this method and perhaps other processes for making chlorine from this source will see further application. Increases in chlorine price will, of course, accelerate efforts in this direction.

In addition to the Hercules' venture, several companies have pilot-planted their own HCl oxidation methods. But there are other processes to make chlorine without caustic*—from HCl and from various metallic compounds or salts—all of which can be expected to be further investigated. In the picture for possible expansion are:

- Solvay's nitrosyl chloride process.
- Salt and sulfur trioxide.
- HCl and sulfur trioxide.
- Electrolysis of HCl (Westvaco or direct electrolysis process).
- Electrolysis of fused salts, potassium chloride, magnesium chloride bittern, lithium chloride and other salts.

Caustic Prospects: Interest in these methods will intensify as the demand for caustic continues to lag behind that for chlorine. But electrolytic manufacturers are not just waiting for these processes to come of commercial age; many are convinced that even at current price levels, the caustic market can be expanded. And they are increasing research and development work toward that end.

In the export field, major producers have been setting up international subsidiaries to carry out integrated selling programs abroad. Increasing foreign sales of caustic in this fashion may not be easy to accomplish in the face of foreign competition, but it represents a positive approach to export opportunities. And it is a big improvement over the sporadic sales effort through resellers or by individual companies that has characterized the industry since the Alkali Export Assn., which used to handle most export sales, was disbanded several years ago.

On the domestic scene, there is stepped-up activity under way in the marketing of specialized industrial cleaners that either use caustic in their formulations or ingredients made with caustic. Among these are products for launderies, canneries, bottling plants and generally industrial consumers who require heavy-duty cleaners. Use of caustic in descaling of metals and desanding of castings, too, shows signs of progress reflecting development and marketing efforts of some of the producers.

Further substantial gains by caustic in this country, however, must be at the expense of soda ash. At present price differentials, ash has the edge. But caustic and ash are technologically interchangeable for about 50% of ash applications. About 30% of ash goes into glass manufacture where caustic is not likely to compete; and some 20% more is consumed in making sodium bicarbonate and in other uses where caustic is not a likely rival.

Because of the upward pressure on ammonia-soda ash prices, caustic stands in a better position to capture some of the marginal ash markets. This will tend to increase the caustic demand, and the picture will be further brightened by the decrease in caustic supply occasioned by the gradual decline in lime-soda caustic output. Two companies, Wyandotte and Diamond, within the past year have just about stepped out of the lime-soda field, and a smaller margin will surely mean others will follow.

But while the lime-soda process fades out, the larger-scale entry of natural ash upon the alkali scene must now be reckoned with. This is true in particular of Westvaco's rapidly increasing production from its extensive trona deposits at Green River, Wyo. Although distant from the important glass centers of the Midwest, the natural product, given a sufficient volume of output, might be competitive in the Chicago and St. Louis areas with some of the Midwest and Southern ash production.

In terms of volume, all natural ash produced will account for perhaps 10% of the entire ash supply. But its availability at this time in increasing amounts may serve to limit further increases in ash prices, and to that degree, it will indirectly affect caustic's chances of making inroads into ash markets.

But by and large, electrolytic producers can see the prospect of widening markets based on a narrowing of the price gap between caustic and ash, as well as rising alkali demand uncovered by research and development. Since these producers have also diversified, they are finding greater use for caustic at the site where it is

* A comparison of chlorine-without-caustic processes by the author will appear in the May, '53 issue of *Chemical Engineering*.

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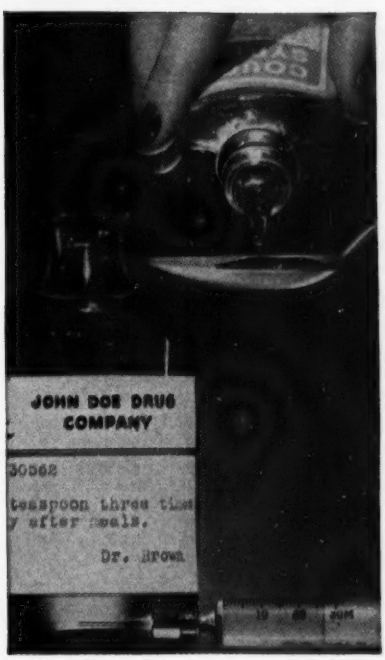

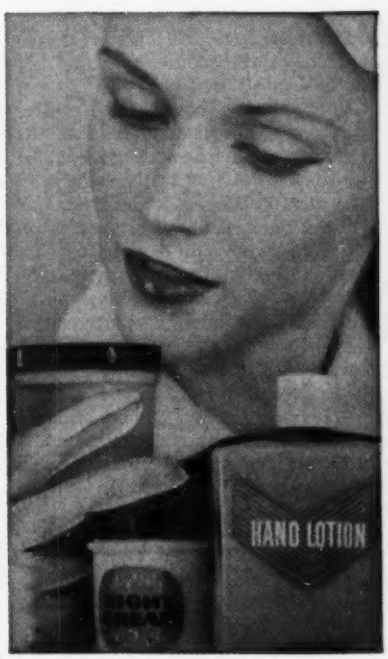

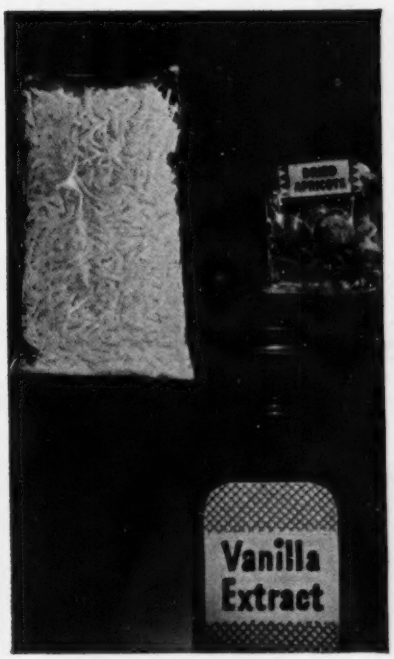

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made. A number of them engage in manufacture of sodium silicates, chromates and phosphates; for all of these products a clearly rising demand exists, and either alkali can be used in their manufacture. In refining bauxite to make alumina for booming aluminum needs, ash is predominantly used. Yet in at least one case on the Gulf Coast, either ash or caustic may be supplied at the producer's option. In cases where both ash and caustic are available, which one is chosen will chiefly depend upon which has the lesser delivered cost.

Both alkalis should find greater use in semi-chemical pulping as the trend toward hardwoods grows. Desulfurization of iron in the ladle with ash, and probably with caustic, too, will assume greater importance as recourse to higher-sulfur coking coal for blast furnaces becomes necessary. Finally, in soap manufacture, caustic may register moderate gains relative to ash. Many soapers buy ash to causticize it for saponification, since this is cheaper than using 50% caustic. But the availability of high-strength (72%) caustic, with resulting economy in shipping and storage, could swing such soap makers back to buying caustic.

Better Cells: This trend to high-strength caustic is but one of many economic and technological developments that will affect the future of the industry. A never-ending search goes on for even slight improvements in cell design or construction, in processing and in transportation.

Keen competition exists in cell design, with a handful doing an active licensing business. Higher amperage is the trend for both diaphragm and mercury cells, with the latest design of the former now using about 20 thousand amps, and the latter over 30 thousand. Along similar lines are improved power efficiency and reduction in floor space.

Although improvement has been made in both cells, the mercury type has registered the greatest recent gains. This is because the caustic so produced is sufficiently pure for direct use for viscose and is of high strength, which makes it cheaper to ship and store. Each grade has its place, however, and in some cases, where a demand for both low-grade and high-grade caustic exists, a combination of the two may be the most efficient installation.

Important steps are being taken to reduce cell operating costs. The sodium amalgam formed in the mercury cell is coming into increasing use as a chemical intermediate*.. And by-product cell hydrogen is approaching fuller utilization especially in the manufacture of ammonia. Dow and Hooker are among those prominent in recent expansion.

The over-all direction of plant design, as current expansions clearly show, is toward large-scale operations with bigger cells. However, simultaneous with this has come an improvement in small-packaged plants. Many such units have been installed abroad, and have appealed in this this country to consumers such as pulpers who, for reasons of location, would rather make their own than buy.

Some of the greatest economies in supplying chlorine and caustic have been achieved in shipping. The wider use of water transportation is notable, in particular for Gulf Coast output. For example, caustic from Dow, Mathieson and Columbia-Southern is largely waterborne, and much of the country's merchant chlorine moves in special barges. On land, larger unit chlorine tank cars (55 tons) have come to the fore. And a considerable amount of chlorine moves by pipeline; such hook-ups have been installed between Westvaco and Carbide at So. Charleston, W.Va.; National Distillers and Hooker-Detrex at Ashtabula, O.; and Diamond and Shell at Pasadena, Tex. Bulk caustic storage at strategic points such as Dow's terminals at Charleston, S.C., and Port Newark, N.J.—to name but two—helps to improve distribution and expand markets.

The sum total of these efforts underscores the essential character of the chlor-alkali business: an industry that moves tremendous volumes of low-cost heavy chemicals from plants requiring large capital investment. Because these materials are indispensable in the manufacture of other chemicals and in chemical processing, their future growth should be steady. Trends of the post-Korea years should continue, with greater diversification and new uses resulting from research and development. Price adjustments and technological improvements for making chlorine without caustic will help the industry achieve its aim of balanced growth.

* Marathon Paper, for example, will make sodium sulfide in its new mercury cell installation at Ontario. Also Mathieson has expanded production of sodium chlorite and alkoxides.

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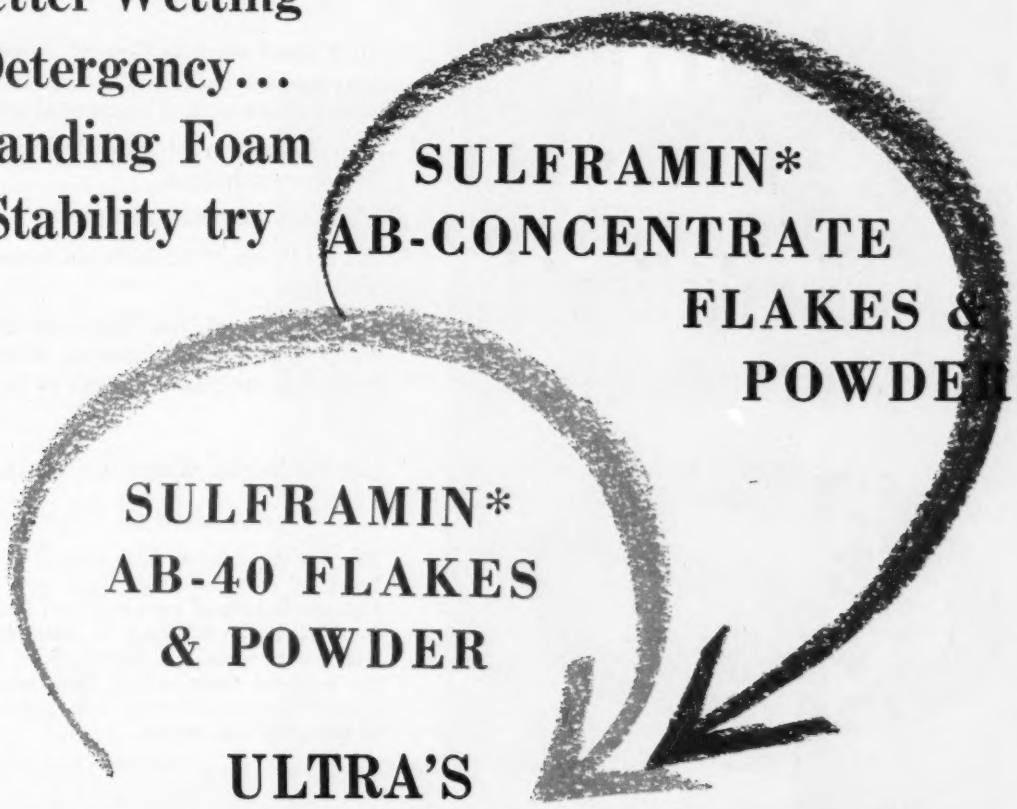

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Chemicals on Location . . .

In Hollywood, where "merely colossal" is almost opprobrium, consumption of photographic film and processing chemicals is so huge that it overshadows the requirements for other chemicals.

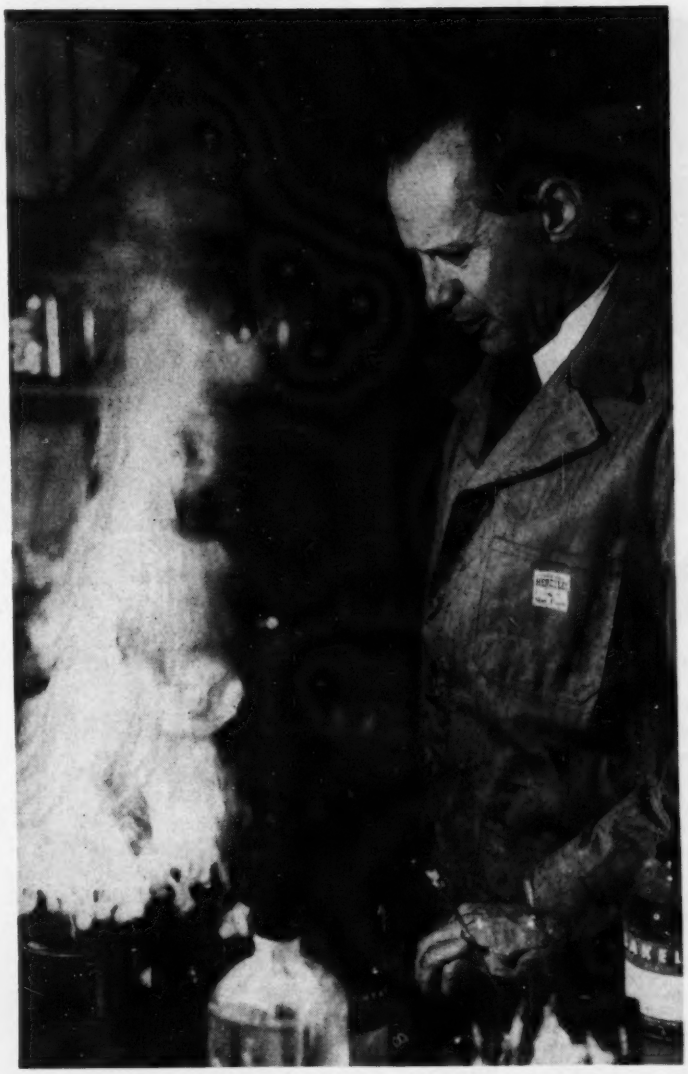
But the special requirements of set construction and special effects has created another sturdy (estimated at well above $800,000) and immensely varied market for chemicals.

And right now, movie moguls are being apprised of the latest techniques and products applicable to the film city industry. Herbert Meyer, chief chemist for the combined studios' Motion Picture Research Council, has recently wound up an 8,000-mile, six-week's swing around the country, checking on new angles.

As Hollywood's talent scout for promising chemicals and chemical specialties, Meyer has called on some 200 research and product development men in chemical and allied industries. His "discoveries" for the year include:

- New rigid type foamable plastics.
- Insolubilizers for water-soluble film formers.
- Supported thermoplastic sheet materials for heat forming.
- Chemicals and processes for upgrading mechanical characteristics of fiberboard.
- New antistatic agents.
- New flame-proofing chemicals.
- Chemicals for preservation of natural cut foliage.

Plenty, and Varied: These just-unearthed materials indicate the variety of the movie industry's interests, quantity and value of which are indicated by a glance at a partial list of one studio's requirements: varnish, paints, enamels—24,000 gal./year; casting plaster, 750,000 lbs./year; alcohol, 6,000 gal.; cleaning compounds, about 3,000 gal.; calcium chloride solution (30%), 6,000 gal. One studio's consumption represents but a tenth of the total requirements of the industry.



HERBERT MEYER, chief chemist for Motion Picture Research Council, experiments with tetra-isopropyl titanate for producing fog effects.

There are two considerations of prime importance in set and prop fabrications: only one, or at most very few copies of any single item are made—eliminating any sort of mass production. And few things are made to last; many of them are used only once, then discarded. These two factors underpin utilization of highly unorthodox materials.

Aside from wood (at least 15 million board ft. of lumber, 25,000 panels of plywood, are demanded yearly) cast plaster is the number one product for set making.

Low-cost, simple to handle, it is used to duplicate everything from marble columns to brick walls. But it has drawbacks: the heavy weight means high cost for transportation, rigging, and supporting structures. Brittleness and chalking are other nuisances.

Technicians have tried adding urea-formaldehyde resins to the plaster slurry to relieve the chalking and brittleness. Unless a prohibitively costly amount is used, however, only the cast surface is improved.

Plastic Chance: As a result, produc-

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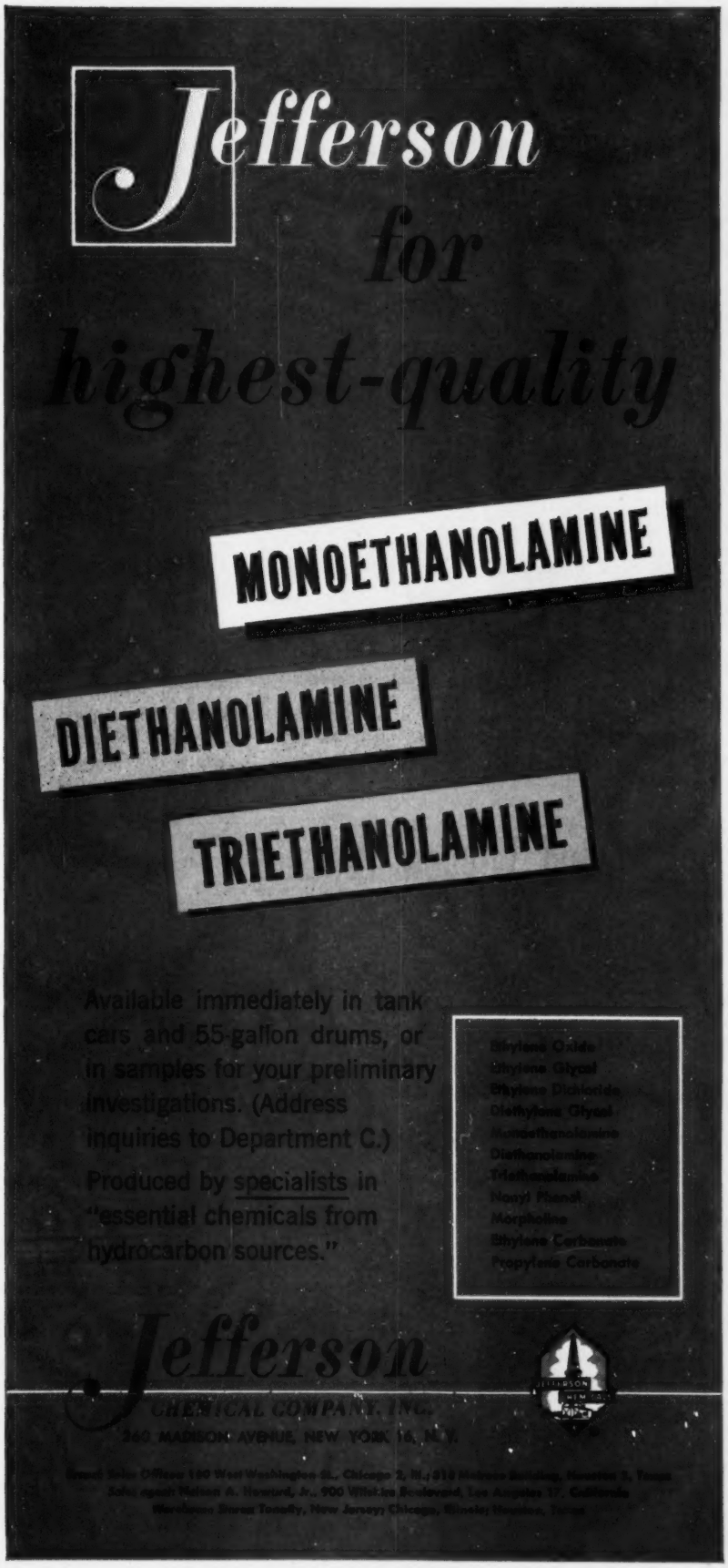
Story begins on page 45

Mock Snow . . .

tion men have turned with fair success to other products.

Plastics offer the most promising substitutes. First to be widely employed were glass fiber-reinforced polyester resins, which can be cast in open molds and set and cured at room temperature with catalysts and accelerators. But after their first enthusiastic acceptance, high material cost prompted most studios to relegate polyesters to fabrication of specialty items where light weight plus durability was a primary consideration.

STYROFOAM, in big blocks, is cemented with perchlorethylene to make the chunks of "snow" for an avalanche scene.



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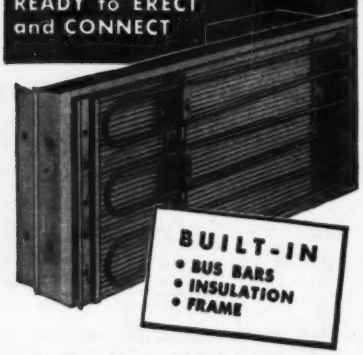

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PAINLESS PANE: Window of polystyrene (with 15% dibutyl phthalate as plasticizer) shatters easily, leaves dull-edged fragments that won't hurt hands.

Story begins on page 45

. . . And Window Dressing

Latest investigations are focused hopefully on thermoplastic composition materials, such as asphalts, petroleum and coal tar resins, waxes and various pitches. Their ample availability, low cost and re-useability make them attractive; their weak points, (*e.g.*, low tensile strength) may be improved by new formulations to meet at least the minimum requirements for the temporary creations of studio work.

Safe Illusions: Along with problems in set manufacture are problems in prop construction and special-effect production.

"Breakaway" prop windows have always been a challenge. They must be glass-like in appearance, and must shatter like glass, but must break into fragments with completely dull edges. A highly satisfactory solution to this problem was discovered recently in a low-polymerized polystyrene-type resin. Meyer estimates the motion picture industry will be using at least 50,000 lbs. of this a year.

Foaming agents are the latest materials to compete with traditional cornflakes for use as falling snow. Discovery of effective foam stabilizers has brought them to the fore.

Chemical fogs—as contrasted with oil fogs--have been superior in terms of density control. They've usually been obtained by interaction of amines and acids, but titanium tetrachloride, and other hydrolyzable compounds have also seen use. Corrosive properties, however, have limited the chemical fogs to occasional outdoor use. A promising recent development is organic titanates, which decompose at elevated temperatures, yielding titanium dioxide and alcohols of relatively low toxicity.

Many such techniques have been worked out by Meyer and the staff at the Motion Picture Research Council, which was formed in 1947 to keep abreast of developments that might aid the movie industry. Eight major studios support the non-profit corporation—Columbia, MGM, Paramount, Republic, RKO-Radio, 20th Century-Fox, Universal, and Warner Brothers. They pool technical knowledge and share equally in benefits of the Council's research.

The MPRC is a coveted trial market

CHEMICAL PROCESS NEWS

PUBLISHED BY CHEMICAL PROCESS DIVISION, THE M. W. KELLOGG COMPANY APRIL 1953

NOTES ON

Ethylene

The world's first naphtha pyrolysis and purification plant for the production of high purity ethylene has now been on stream in England for well over a year. A second is under construction in Italy.

***

Both were designed by Kellogg. The one in England has consistently produced high yields of ethylene with a purity of 99.9%. Loss during low temperature fractionation is less than 3%.

***

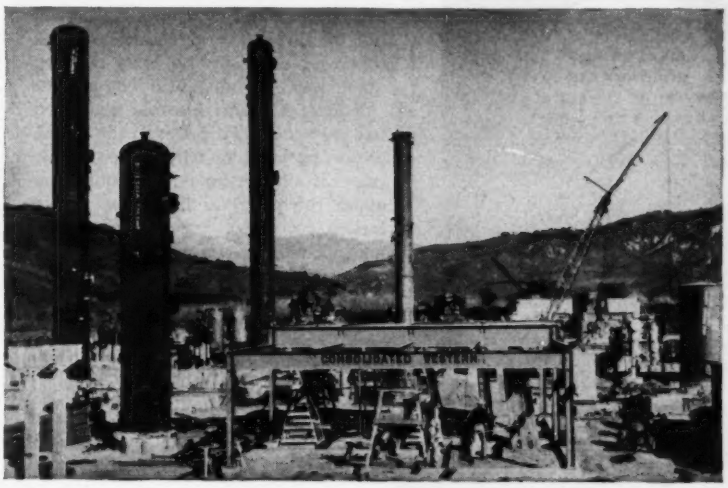
Of particular interest is the fact that the C-3 product made as a bottoms stream from the deethanizer contains 93–97% propylene . . . indicating the high selectivity of the cracking process for olefin production. This by-product is suitable for chemicals production at high efficiency without fractionation between propylene and propane.

***

Actually the plant may be operated under different conditions to produce olefins in varying proportions. This has been well demonstrated in work done over a number of years in Kellogg's naphtha pyrolysis pilot plants. Such flexibility would be particularly important to the processor whose markets for various olefins might change in accent.

***

Current interest in naphtha pyrolysis as the prime step in producing high yields of olefins is largely restricted to processors abroad. Domestically, heavy gas oil will probably become important as a charge stock.



High Pressure Gas Reforming Slated for West Coast Ammonia Unit

A special high-pressure gas reforming plant will be the feature of a new ammonia plant Kellogg is currently erecting for a West Coast processor.

The result of pilot plant studies by Kellogg, the reformer section of the plant makes use of the fact that natural gas is usually available at relatively high pressure. Kellogg engineered this section to conserve the potential energy of the natural gas. Although synthesis gas will still be further compressed before it is charged to the converter, the new high pressure reformer will save about 25% to 35% on compressor horsepower.

The ammonia unit also includes the Kellogg reactor, which employs layers of catalyst, with an efficient means of cooling the gases in between, to closely approach ideal point-by-point temperature control.

For further information, technical data, etc., relating to chemical or petrochemical processing, write

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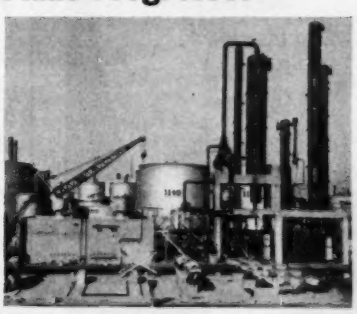
New Iso-Octyl Alcohol Plant Progresses



Engineered by Kellogg, this new iso-octyl alcohol plant is scheduled for completion this year. The vessels on the concrete structure at the right are the alcohol, alcohol re-run and aldehyde towers. They comprise only a small portion of the complete unit.

Kellogg is also currently designing several different types of alcohol plants for other processors. These include units for the production of a wide range of alcohols.

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for new products, or for new uses of old ones. Its laboratories are filled with several thousand samples of new materials to be tried out. It—and the movie industry generally—can take credit for some important marketing developments. For example, the motion picture industry claims responsibility for much of the early development work in antistatic compounds.

Sticker Stickler: Another new product grew out of the search for a wallpaper paste that would permit the paper to be removed without damaging the plywood flats used for interiors. Council researchers tried methylcellulose – Dow's Methocel – mixed with glycerine and water. It worked, with estimated savings to the eight supporting studios of $200,000/year.

Other chemical companies asked Meyer why their cellulosic ethers weren't used. One, told that its product did not peel so well, got the idea of using it as a nonpeeling paste. Result: Cellulosic wall paper paste, stainless and mold-free, is crowding wheat paste for commercial use.

Needs: Beyond telling movie makers how they can profit by recent chemical developments, Meyer has listed needs (with emphasis on low cost) of the film industry that chemical producers can meet:

- Cheap, lightweight structural materials.
- Low-cost plastic foliage.
- Nontoxic, nonirritating black and colored smokes.
- Cheap, rigid foams that can be cast in open molds.
- Permanent and portable soundless flooring materials.

There's diversity, and there's volume, too. Studio economy drives last year cut into expenditures, but with three-dimensional filming giving the industry a shot in the arm, and with TV filming on the upswing, the market for chemicals looks like it's in for a hypo, too.

Cellulosic Challenge

New, low viscosity (half-second) cellulose acetate butyrate, set for full-scale production in Eastman Chemical Product's Kingsport, Tenn., plant looms as a competitor for nitrocellulose and acrylic lacquers.

Introduced last month at the Cincinnati meeting of the Paint, Varnish and Lacquer Production Club, the new cellulosic polymer shows promise in both wood and metal lacquers, and looks good for peelable coatings, too.

Eastman says finishes made with its new product, which supplements its long-used 20-second cellulose acetate butyrate coating polymer, are more resistant to ultraviolet rays and water-staining than nitrocellulose coats. Further sales points: it is shipped dry, and finished films are less flammable than other types.

Costwise, the older cellulosics may have the edge (dry-basis nitrocellulose is 33¢ a lb., the c. a. b. about 54¢). But Eastman avers that savings in solvent costs pretty well even up the finished coat costs, and claims a definite saving over some acrylic metal lacquers.

Standard spray equipment can be used with the typical formulations that have been worked out and offered to interested firms. Since the c.a.b. polymer isn't compatible with other resins to the same extent as the nitrate, Eastman researchers are continuing work on compatibility tables.

Never Static: With a heavy stake in the coatings business (nearly 75% of all furniture finishing is done with

METAL SPRAYING: For lacquers, a new, "thin" cellulose acetate butyrate.

cellulosics; all General Motors cars plus a number of others are nitrocellulose painted), other firms in the cellulosic lacquer trade haven't stood still on developments, and this will likely spur them on.

Hot spraying, to apply a heavy film in a single pass of the spray gun, has been one exploited technique. And a

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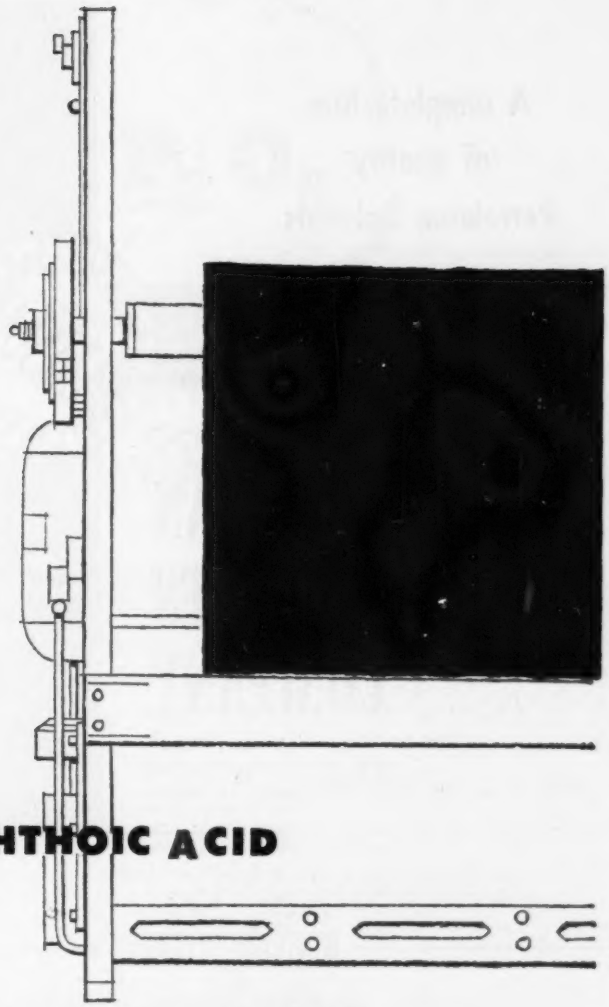

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- **DYE INTERMEDIATE**

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SPECIFICATIONS

Color	Light yellow
Melting Point	216°—220°C.
Assay (Titration)	98.5% min.

SOLUBILITY, 25°C., in gm./100 gm. solvent

Water	Insoluble
Acetone	15.3
Ethanol	9.4
Ethyl Acetate	6.8
Benzene	Insoluble

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new idea to prevent discoloration of blond wood furniture calls for incorporation of a sun-screening agent in the lacquer formulation.

The half-second c.a.b. presented a real production challenge to Eastman; it looks now like a real challenge to other lacquer supply makers.

Farm and Garden

Crag Herbicide-1, Carbide and Carbon Chemical Co.'s weedkiller, is now being packaged for the gardener. The package holds four ounces, is said to be enough to give pre-emergence treatment for 3,000 sq. ft. and can be used with some 56 varieties of plants.

• For the farmer rather than the gardener is the new plant of Charles H. Lilly Co. (Albany, Ore.). The new facilities are for storage of 40,000 gals. of anhydrous ammonia. It is the only plant of its sort in the Willamet Valley agricultural area.

• Also in the Pacific Northwest, in Yakima, Wash., Central Aircraft, Inc. is readying between 55 and 60 Stearman biplanes to spray extensive acreage of Canadian forests. Target: the spruce budworm, which is threatening Canadian timber. DDT formulations will be used to treat more than a million acres; the job will begin May 1.

• Weedkillers, not bug killers, are in the news from Ethyl Corp. That firm is boosting production of the herbicide 2,4,5-T, which is particularly effective against mesquite and similar woody plants, including poison ivy.

•

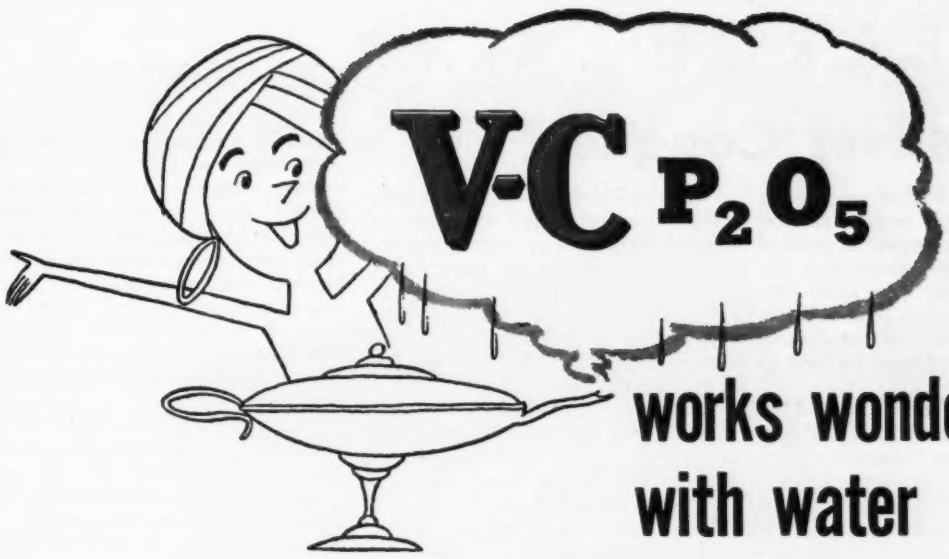
Price of Health: It's been costing too much to stay clean at the Central Louisiana Hospital, Pineville, La., opines the state's auditor. He said prices paid for liquid soap and pine oil disinfectant were much too high. The soap was being purchased at $2.70/gal., "where 75¢ would have been fairer," and pine oil "was overpriced, too"—at $2.40/gal.

•

Whitener: Hilton-Davis Chemical Co. (Cincinnati Div., Sterling Drug Co.) is introducing a new optical whitening agent tabbed Hiltamine Arctic White N. It is designed for nylon and wool, and can be applied from alkaline detergent baths as well as soap baths.

•

Value: Risdon Mfg. Co. (Naugatuck, Conn.) is introducing a new valve featuring a flexible metal diaphragm and a nylon or teflon valve seat. New unit is claimed to permit use of all standard propellents, including Freon 21 and 22, as well as methylene chloride.



works wonders with water

Whether you are manufacturing cleansers or water softeners, processing textiles or cheese, dispersing clay or treating boiler water, it will pay you to investigate the advantages of V-C Sodium Phosphates. Their water-softening ability, emulsification and dispersion properties and free-rinsing quality over a wide range of uses are outstanding. Examine the individual characteristics of each V-C Sodium Phosphate, outlined below, then write for full details.

V-C DSP (Disodium Phosphate) Anhydrous

Specifications: Minimum P_2O_5 content is 48.0%; less than 2% moisture. The pH of a 1% DSP solution is 9.0.

Physical Properties: Small white flakes, readily soluble giving a clear solution.

Characteristics: Mild alkalinity, emulsifies fats and oils, "deflocculates" or suspends solids, is a good buffer.

Advantages: Anhydrous DSP contains no water of crystallization as does the duohydrate DSP or crystalline (12 H_2O) DSP. Very economical, less alkaline than TSP, excellent water softener.

Uses: Boiler water treatment to control caustic embrittlement, textile cleaning, manual cleansers, plasticizer in the manufacture of processed cheese, and many other uses.

V-C TSP (Trisodium Phosphate)

Specifications: Surpasses requirements of Federal Specification O-T-671a and ASTM Specification D538-44. P_2O_5 content is 18.5%. The pH of a 1% TSP solution is 11.8.

Physical Properties: Easily soluble white crystals.

Characteristics: Readily emulsifies fats and oils, softens water, "deflocculates" or suspends solids, rinses clear.

Advantages: Has higher alkalinity than DSP or polyphosphates. Good water softener. Economical.

Uses: For manufacture of cleansers, cleaning compounds, soaps and water softeners. Also for metal cleaning, boiler water treatment, textile processing, and other uses.

V-C STPP (Sodium Tripolyphosphate) Anhydrous

Specifications: Minimum P_2O_5 content is 57%; less than 1% moisture; calcium value, 10. The pH of a 1% STPP solution is 9.8.

Physical Properties: Anhydrous white powder (finer than 20-mesh), soluble in water.

Characteristics: Mild alkalinity, good sequestering agent, very effective peptizing agent, fairly stable.

Advantages: Greater sequestering power than TSPP. Cheaper than organic sequestrants. More stable than other polyphosphates except TSPP.

Uses: Builder for synthetic detergents and soaps, boiler feedwater treatment, industrial cleansers, textile processing, paper manufacturing, clay dispersing and many other uses.

V-C TSPP (Tetrasodium Pyrophosphate) Anhydrous

Specifications: Minimum P_2O_5 content is 53%; less than 1% moisture; 98.0% $Na_4P_2O_7$. The pH of a 1% solution is 10.2.

Physical Properties: Anhydrous white powder (finer than 20-mesh), soluble in water.

Characteristics: Exceptional water softening ability, high emulsification and dispersion properties, mild alkalinity, good buffering and rinsing properties, very stable.

Advantages: More stable than other polyphosphates. More economical than organic sequestrants and other polyphosphates.

Uses: Builder for synthetic detergents and soaps, mud treatment, water treatment, textile processing, industrial cleansers, cheese manufacture, cold water paints and other uses.

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Disodium Phosphate-Anhydrous
Tetrasodium Pyrophosphate
Sodium Tripolyphosphate
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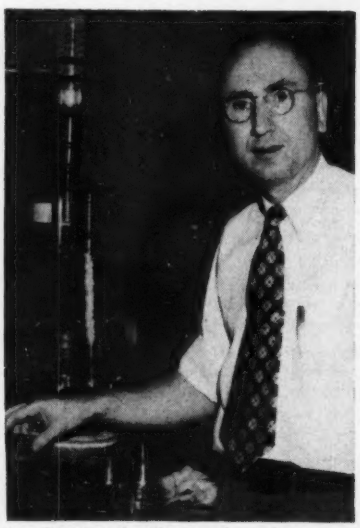
Quicksilver Conquest

Straight from the land of superlatives comes word of still another peerless performance. A commercial method of making diphenyl mercury is the latest offering from the Lone Star state. Slashing the price from $100/lb. to $15/lb. is the promise that elevates the process from a simple footnote to bold headlines.

Undaunted by the commonly held belief in the commercial futility of academic research, two University of Texas chemical engineers, Kenneth Kobe and Roy McCutchan (now with Southwest Research Institute), just received



U. of TEXAS' KOBE: The only way to go is up.

U.S. Patent 2,628,241, may well get more substantial recognition for their quicksilver endeavor. For should this process mature as expected, declares Kobe, it will open many new fields of research and development. Though most conspicuous, diphenyl mercury isn't the only compound covered in the method. Sharing the spotlight: ditolyl, dixylyl, dicumyl and dicymyl mercury.

Promising Possibilities: Despite their availability, mercury diaryls have aroused but little interest—and that principally as research curiosities. Price is too high, compounding is hard, yields are low, separation is difficult. Now, with this academic impetus from Austin, the compounds could come into their own as industrial intermediates for making other metal aryls; could commercially realize their specific properties as germicides, fungicides, herbicides and insecticides.

Kobe and McCutchan claim to have overcome most of the objections to previous processes by putting the operation on a continuous basis, using relatively inexpensive reagents (*e.g.*, ammonia sulfide, phenyl mercuric acetate and ammonia hydroxide), upping the yield to 98% and simplifying the formulation and separation.

Process Parade: Formerly, diphenyl mercury was synthesized by reacting sodium amalgam with phenyl bromide (yields 27% to 47%), or mercuric halides with phenyl Grignard reagents (yields 44% to 81%; reagents expensive and hard to prepare). There are other minor methods giving even lower yields.

Today, the small amount of diphenyl mercury required for research syntheses is supplied mainly by the Maynard method. Originated in 1924, this process is based upon the reduction of phenyl mercuric acetate by sodium stannite solution. Diphenyl mercury, metallic mercury, sodium stannate and sodium acetate are formed. Separating the products is difficult because the metallic mercury is in a colloidal state. The method is slow and cumbersome. While Maynard claimed 95.6% yield, Kobe and McCutchan could get only 62% yield duplicating his synthesis.

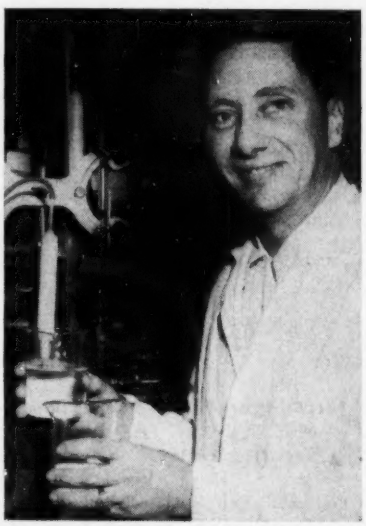
Although the Texans also report an improved batch technique,* it is their continuous operation that gives greater promise. By using a hydrocarbon suspension, Kobe and McCutchan raise the yields for their cyclic process, simplify the separation.

As in the batch method, phenyl mercuric sulfide is precipitated by passing hydrogen sulfide through a solution of phenyl mercuric acetate, ammonium acetate and ammonium hydroxide. After a water washing, however, the precipitate is suspended in toluene, then heated to boiling. The diphenyl mercury, mercuric sulfide, water and toluene are separated and later recovered.

The important economy feature of this process—in addition to the relatively inexpensive reagents used and high yields—is the easy separation and recovery of the mercuric sulfide.

Prospective Picture: Diphenyl mercury, along with the other mercury diaryls, owes its value as an intermediate to its atypical substitutions, ease of reaction and high reactivity with various elements and compounds. Some of the more important metals that can be diarylated through aromatic mercuration: aluminum, arsenic, bismuth, cadmium, gallium, lithium, magnesium, phosphorus, potassium, selenium, sodium and zinc. In addition, the mercuric compounds react with halogens giving corresponding aryl halides.

Whether or not the diaryls' use as industrial intermediates will outweigh their value as bacteriostats and bactericides is a moot question for the present. More important right now, as Kobe points out, is the need for actual



SRI's McCUTCHAN: For a higher yield, a simpler process.

market development. Presently, the demand on the diaryls is so limited that one major supplier of diphenyl mercury, DPI (Distillation Products Industry, Rochester, N.Y.) farms out production to a near-by college laboratory.

Once the scramble for development begins, new problems will undoubtedly arise. (Very likely: need for greater solubility.) But a big hurdle has been cleared. And starting so close to bottom, the only way diphenyl mercury can go is up.

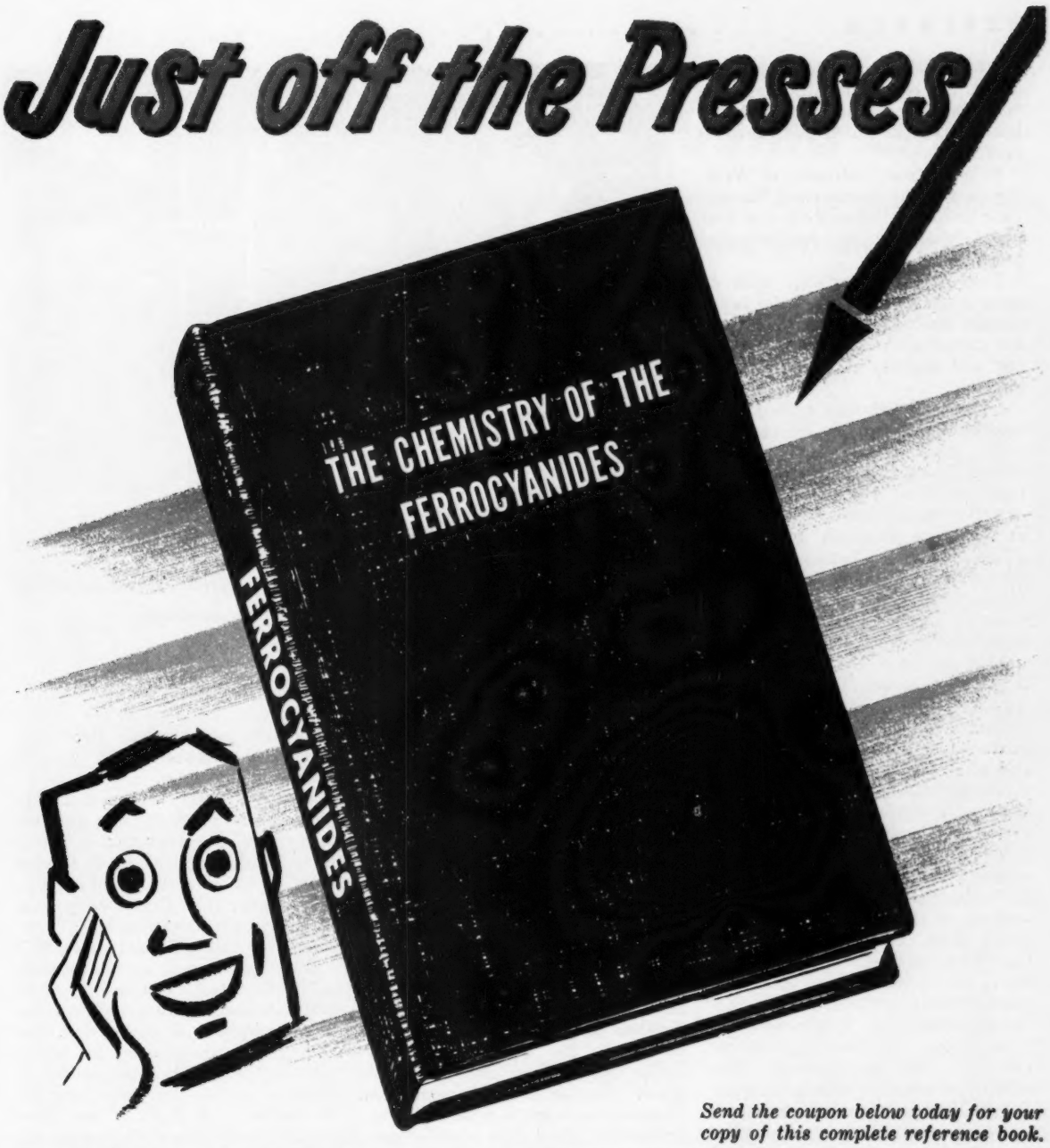
* Phenyl mercuric sulfide is precipitated by passing hydrogen sulfide through a phenyl mercuric acetate, ammonium acetate and ammonium hydroxide solution. The precipitate is decomposed by heat to diphenyl mercury. Yield is 89%.

Drugs Dig In

From chemical research flows an endless stream of new products, processes, applications and ideas. The accent this week is on pharmaceutical development. Fresh out of the nation's laboratories:

- News from the University of

Just off the Presses!



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This newest volume in Cyanamid's Nitrogen Chemistry Library presents a detailed summary of the known physical and chemical properties of sodium and potassium ferrocyanides and of hydroferrocyanic acid, together with known and proposed applications in many industries.

Cyanamid presents this volume in the hope that it will be of value to those active in research and production in a variety of different fields, as well as to scientists in schools and colleges. The properties of the alkali ferrocyanides, and derivatives easily obtained from them, are of particular interest in chemical synthesis, separation and purification of commercial chemicals, steel processing, mineral dressing, and photography.

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Southern California offers insight into atomic age protection. USC researchers recently demonstrated that methyl linoleate acts as a defense against X-rays in rats.

• Word from University of Washington workers augurs well for silicone producers. Silicone oils now look like a good bet for dermatological preparations.

Tested for compatibility with 42 other compounds used in balm bases, silicone oils compared favorably with the control chemicals in ease of mixing and stability of the medicated ointment.

Silicone oil liniments proved pharmaceutically similar to accepted formulas, aren't subject to odors or rancidity. Their wide viscosity range give them an added edge in flow control.

• Recent reports from workers at Wellcome Research Laboratories (Tuckahoe, N.Y.) betoken relief for America's eight million victims of high blood pressure. The group has just come up with a family of long-acting hypertension drugs.

Most potent of the vasodepressors is titled No. 48-80. Prepared by heating N-methylhomoanisyl amine with formaldehyde, it is believed to be a mixture of dimers, trimers, tetramers and some higher polymers.

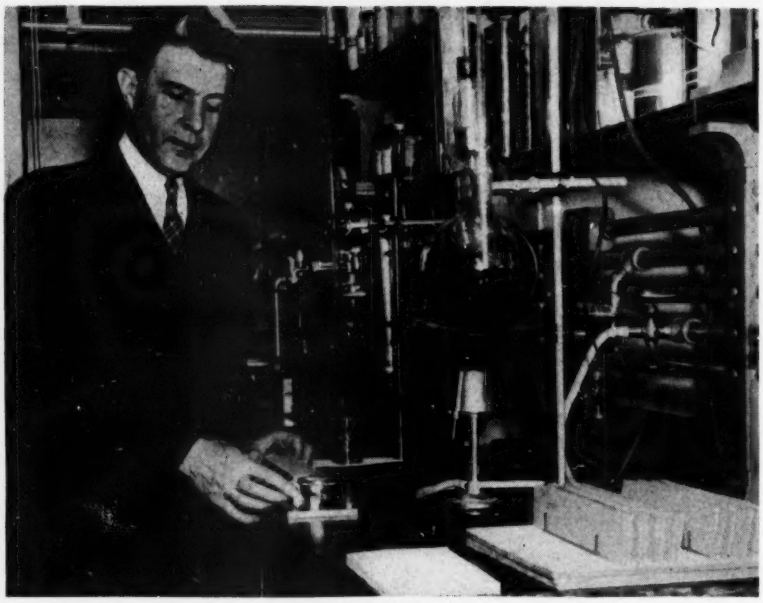
Though similar to histamine in vasodepressant action, the drug is not touted as a histamine substitute.

Meanwhile, two Harvard University chemists, Morris Kupchan and C. V. Deliwala, have just devised a new method of separating hypertension drugs from the Veratrum plant. Claimed to be shorter and easier than the current method, it uses chromatographic technique instead of countercurrent distribution, This news could prove a boon to those clinically investigating the vasodepressant alkaloids, germitetrine and neogermitrine.

And farther south, Georgetown University researchers are also doing their bit for sufferers of high blood pressure. Latest experiments at GU show that mono and di-N-substituted aminoethyl-2-hydroxymethyl-*cis*-cyclohexenes reduce blood pressure in dogs.

• News from A. J. Parker Co. (Philadelphia) offers succor to the multitude of wheezing asthmatics. The firm is investigating phenarsenide for its palliative effect in asthma.

Results of a recent experiment at Philadelphia's St. Agnes Hospital, reports Dr. Aron Fishman (St. Agnes' allergy chief), look promising. Of 45 patients treated with phenarsenide, 33 experienced effective relief from the asthmatic seizure.



UPSON'S ERICKS: Without water, increased stability.

No-Warp Wood

From offset printers plagued by moisture-expanded gaps in multicolor forms, to cotton couturiers blighted by shrinkable fabrics, the welcome word is stability. And stability for cellulose fiber products is the Upson Co.'s (Lockport, N.Y.) claim for its new process.

Dogged by warped wooden corners, Upson, a wallboard manufacturer, wanted an answer to the unpredictable expansion and contraction of cellulose fibers. So in 1945, Upson hired researcher Walter Ericks, took on this problem of stability. Now ready for evaluation, the Upson method involves treating fibers principally with glycol dicarboxylic acid monoesters (formerly regarded as undesirable by-products of alkyd resin manufacture), partial esters of polyhydric alcohols and polycarboxylic acids, and polyhydric alcohols and polycarboxylic acids themselves.

Monoesters of the first group containing 8 to 14 straight chain carbon atoms—produced by reaction of glycols with dicarboxylic acid anhydrides—have proved most effective, so far, In one fiberboard experiment carried out by the company, propylene glycol sebacic acid monoester reduced the board's expansion and contraction by 90% over a 0%-90% relative humidity range. Other equally outstanding monoesters, says Upson, are triethylene glycol adipic acid monoester, nonylethylene glycol phthalic acid monoester, pentaethylene glycol succinic acid monoester and glycerol citric acid monoester.

Upson, however, believes that compounds from the other groups also have their place, is working on a patent for a fourth class in order to blanket the field of potential cellulose fiber applications. (The first three general classes have just been patented: U.S. 2,629,648; 2,629,674 and 2,629,701.)

Goals Set: Underlying this research is one important theoretical goal: to find substances with an affinity for cellulose equal to or greater than that of water. As research director Ericks points out, water taken up by cellulose (believed to be chemically held by the secondary valences of the cellulose hydroxyl groups) is strongly secured between parallel walls formed by adjoining cellulose chains. As water soaks in, it pushes the cellulose walls apart, causes the fibers to swell laterally. When water is released, the fibers contract; then walls warp.

Upson found in the course of its research that organic compounds with a molecular weight under 6,000 and with two or more hydroxyl units in the molecule had a high affinity for cellulose. After narrowing the field to the present three (potentially four) groups, it believes that it now has the chemical stabilizers that can beat water to the interstitial gaps in cellulose fibers.

A secondary goal in this research

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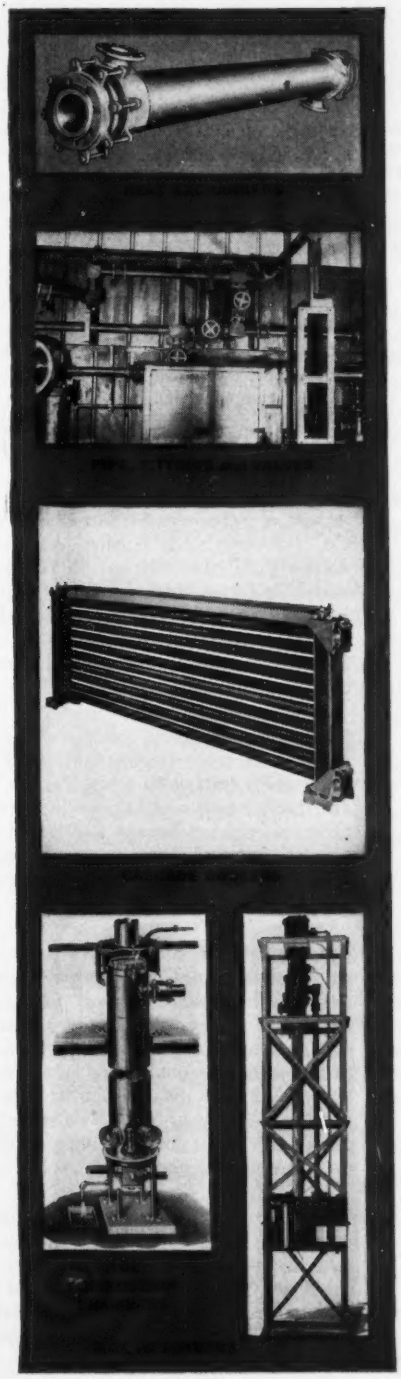

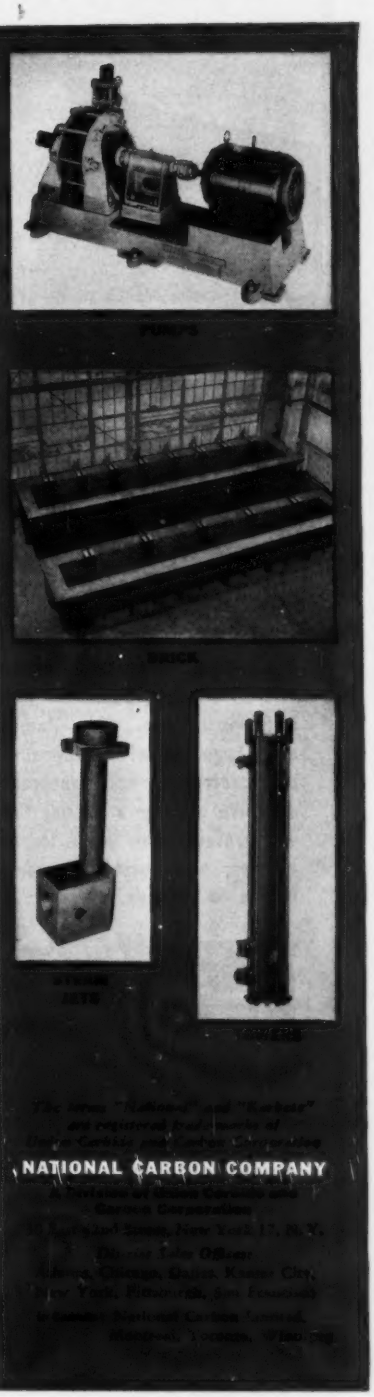

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is simplicity of application—preferably by spraying, immersion or mixing with beater stock (for paper making). Upson now claims to have realized this simplicity, at least for fairly thin and felted boards. For thicker timber, a compromise using pressurized vacuum spraying is needed to achieve the desired penetration. A 96% reduction in expansion and contraction is possible, avers the company, with only a 20% concentration of the stabilizer.

With a potential expansion of applications, Upson may well cross other cellulose processing paths previously blazed by Cluett-Peabody's Sanforizing, Carbide's glyoxl, Du Pont's crystal urea and perhaps others. Now, still unsure of its suitability for fabrics, the company is ready to license the process. Allied wood-workers will likely be the first takers.

•

New-Fledged Research Setups: To keep the research stream from ebbing, modern laboratories are continually going up while others are expanding. In this week's roundup:

• Expansion is the keynote for Jones-Dabney division of Devoe & Raynolds Co., Inc. (Louisville, Ky.). Contractors just started a $450,000 addition to present paint lab facilities. Function: research on resins, solvents, oils and driers used in making paints.

• Bureau of Mines plans a $750,000 boost for rare earths study. Contracted for Mar. '54 completion, the Rare and Precious Metals Experiment Station is slated for Reno, Nev. Main objective: to increase useable mineral reserves of the Far West.

• A transfer of research activities is in the wind for Eston division of American Potash & Chemical Corp. (Trona, Calif.). Projects and personnel will soon move from Trona to Whittier (Calif.) where a lab is a-building.

• And a midsummer move is in the offing for Illinois Institute of Technology's Armour Research Foundation. Still within Chicago confines, ARF's future headquarters will free present offices for conversion into new laboratories needed for increasing activities. Expected 1953 research volume: in excess of $9 million.

• Multiplicity is the theme for American Smelting & Refining Co.'s just-dedicated South Plainfield (N.J.) site. The structure will house 65 physical and chemical metallurgy laboratories.

• It could be fun, but it's research, too. University of Puerto Rico's Agricultural Experiment Station now has a spanking new rum studies unit. Designed by Arthur D. Little, Inc. (Cambridge, Mass.), the experimental distillery marks an additional $0.5 million investment in rum improvement by the insular government.

• Largest research outlay noted this week comes from AEC for the newly opened Argonne Cancer Research Hospital (Chicago). Cost is $4.2 million. It will use all known radiation sources for the study of cancer, will be operated by the University of Chicago as part of its cancer research center.

• Finishing off this latest construction flurry is Linde Air Products Co. division of Union Carbide & Carbon Corp. Linde just started a $350,000 lab expansion (Tonawanda, N.Y.) to keep apace with its rapidly growing silicone operation.

•

Dynadye Debut: Recently introduced by Amalgamated Chemical Corp. (Philadelphia), Dynadye V is being promoted as a dyeing assistant for the processing of Dacron, Orlon and Dynel fibers either by themselves or in blends with viscose and acetate. It's a sodium salt of a complex phenol, is said to give high color fastness.

•

Ahead of Schedule: Stepan Chemical Co. (Chicago) has finished research sooner than expected on use of raw materials (other than tallow) for making fatty alcohols. Stepan feels it can, and probably will, make batches of fatty alcohols from cottonseed, corn, linseed and menhaden oils.

•

Safe Solvents: Bland odor and low toxicity characteristics are the interest-sparkers in Monsanto Chemical Co.'s (St. Louis) two new high-boiling solvents, phenylcyclohexane and bicyclohexyl. Suggested uses, apart from solvents: compatibilizing and penetrating agents.

•

Persistent Prevarication: Yale University (New Haven, Conn.) investigators declare "truth serums" are fallible. Results of a recent study reveal that sodium amytal and sodium pentothal (drugs most commonly used in narcoanalysis) do not always uncover falsehoods. In fact, warns the Yale report, many individuals continue lying while under drug influence.

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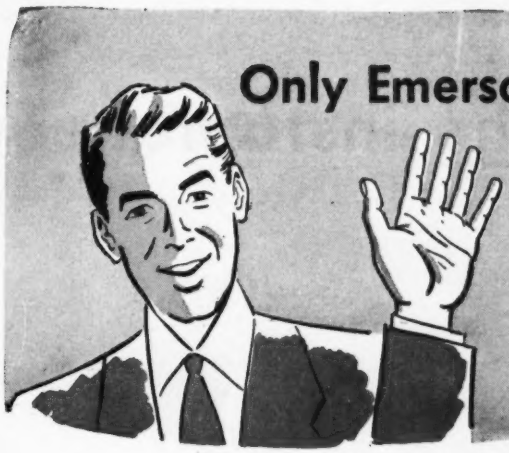
Rubber Aid: Du Pont is boosting its new elastomer, Hypalon, as the answer to rubber woes. A chlorosulfonated polyethylene, Hypalon is said to solve many problems of chemical deterioration plaguing natural and synthetic rubber.



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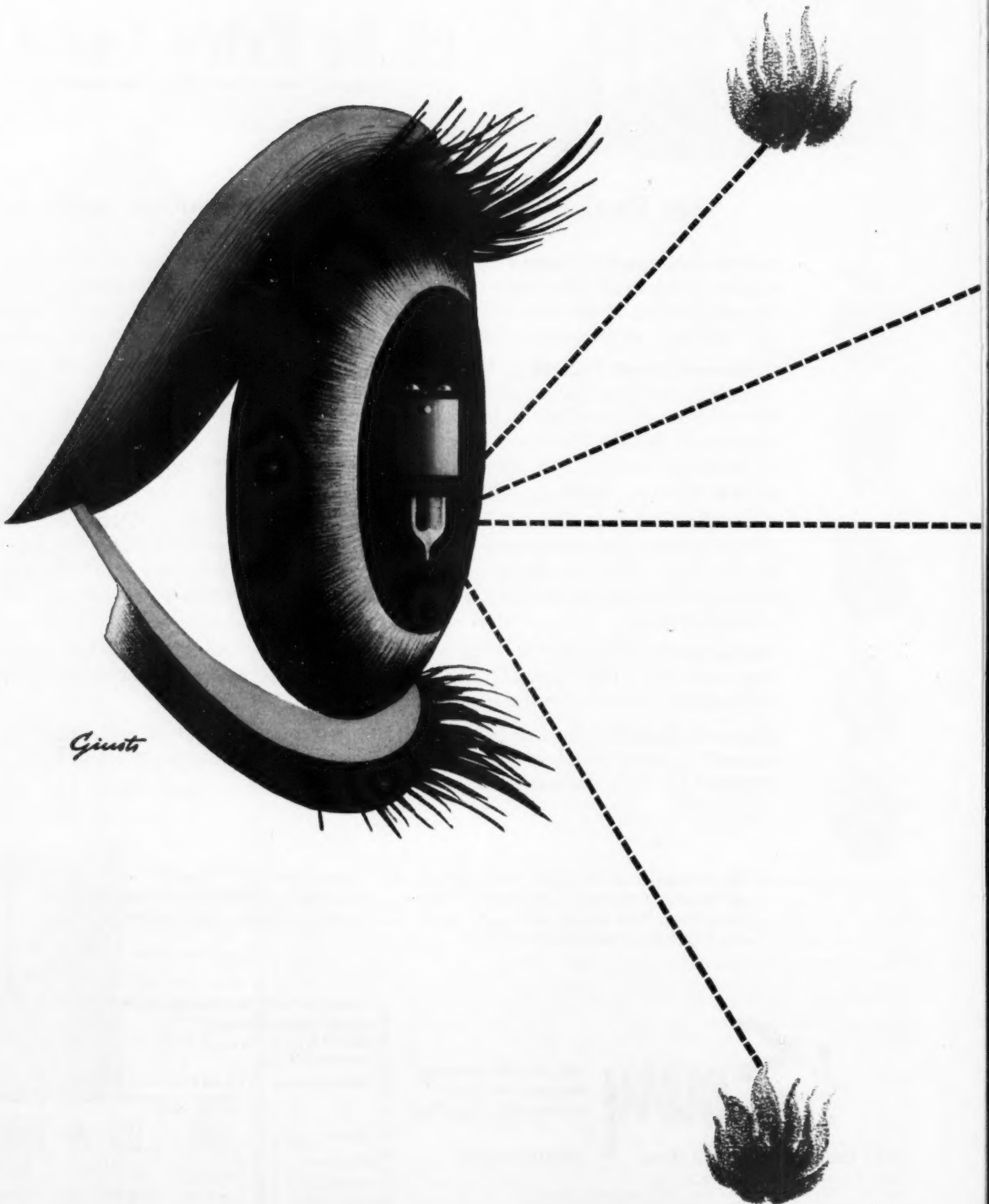

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fireye

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Trio of Towers

If good things still come in three's the latest developments in fractionating columns—Koch Engineering Co.'s horizontal Kascade trays and Shell Development's Turbogrid trays—can bank on a solid future; for they are now joined by a third—a European contact plate just introduced in this country by Charles Pfeiffenberger, a private consultant.*

Like the other two, the most recent twist in tower plates can trace its lineage more directly to the sieve- (or perforated-) plate than to the bubble cap.

With a Difference: But actually, each is a distinct departure in design in its own right and the three are similar more because they can't be classified as bubble caps than by any other norm. Pfeiffenberger's plate—which is called the Kittel contact plate—(after its Austrian inventor, Walter Kittel) is nothing more than a piece of metal perforated by expanded metal fabricating techniques.

To understand the expanded metal plate, you have to visualize a triangular piece of metal (a section of which is shown in the client's hands in the picture) containing many small parallel slits. One lip of each slit is pushed downward, the other upward. The result is a piece of metal full of many vertically inclined, rhombic openings. Several of these triangles are joined to form a circular contact plate.

To any vapor passing through the opening then, there is imparted a horizontal—as well as vertical—motion. And by varying the positions of the triangles that make up the plate, it's possible to get any one of several patterns of motion.

But the most popular arrangement in Europe is to build the plates in sets of two. On the upper plate, openings are placed so that the vapor (hence the liquid) moves in a circular fashion to the outer rim. It drops to the lower plate where the motion is reversed and the liquid moves toward the center before dropping to the next set of plates.

Thus, reasons Pfeiffenberger, chances of "dead zones" are reduced. He adds that it is simply a case "of harnessing the kinetic energy of the rising vapor to get a more intimate contact between the liquid and vapor phases."

Pfeiffenberger claims that the net result of the new plates is to give a higher rate of throughput and a corresponding reduction in investment.

* Since 1923. After getting his Ph.D. from Heidelberg, he worked for I. G. Farben as an engineer for a few years. He started in this country as a specialist in dyestuffs and intermediates, now has his own consulting business in Hollis, N.Y.

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A thought or two about things new and interesting in the field of surface-active chemistry . . .

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won't beset the fellow who formulates his bubble bath product with EMCOL 4150. Whether he appeals to ladies of luxury or small fry, he'll be able to boast the spongiest, most voluminous, longest-lived bubbles ever bottled. And among its added attributes, the lack of skin irritation, the elimination of bathtub 'ring' and the absence of powders are not to be sneezed at.

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He avers that bubble cap towers that have been converted to the Kittel system have shown capacity boosts ranging between 30 and 50%. He adds that the Kittel towers are simple to put together, easier to maintain than a comparable bubble cap tower.

They will, however, require individual engineering for each application. His original plan was to license to American firms who would be willing to build them, but he now intends to import the towers complete from the manufacturer (Stahle Apparate & Geraete Bau Co., Mannheim, Germany.)

Besides the obvious applications in distillation, Pfeiffenberger hopes to sell units for gas scrubbing and purification and for all types of cooling operations.

Slotted for Savings: Shell's Turbogrid trays are also designed to give higher capacities. In fact, says Shell, they allow 20-100% more throughput than a well-designed bubble cap tower.

In this case, however, the tray is merely a flat grating over the entire cross-section of the column. Openings in the grating take the form of parallel slots.

The Turbogrid trays have lower efficiencies than a bubble cap. But the increased capacity means that more trays can be installed for a given tower height and the over-all effect is an efficiency per foot of column height that's about the same. In addition, the towers are said to be cheaper to install and maintain.

One possible disadvantage of the Turbogrid tower is that the holdup time for liquid is small. That would mean that a chemical reaction, for instance, would not go to completion. Also, it gives the tower a minimum throughput and it would not have the bubble cap tower's flexibility.

Horizontal Design: The Koch horizontal Kascade tray was introduced early in 1951 (*CW, Feb. 17, '51*). The tray is made up of a well, a series of solid metal strips curved in the same direction and a series of vertical screens set above the curved sections. Liquid drops from the well onto the plate. There it meets the vapor rising through the curved strips and is thrown against the screens, which serve as a contacting medium and as a means of separating the liquid from the vapor.

The Kascade tray is designed for high vapor and moderate to low liquid loads. One big feature is the pressure drop, which can be as low as 1 mm. per tray. Another is the maintenance costs, which could run 50-75% that of a comparable square footage of bubble cap trays.

Piped Coal

"Transmission of coal by pipeline can be developed economically." So said George Love, president of Pittsburgh Consolidation Coal Co., in a letter to stockholders last week.

The coal-via-pipeline has been one of the most widely discussed facets of the firm's many-faceted research program on coal. But aside from a brief mention of the project two years ago (*CW, Mar. 10, '51*), officals of the company have steadfastly refused to discuss it. Since then, however, PCC has approached at least two big utilities—as customers for the piped coal—and both have evinced interest in it.

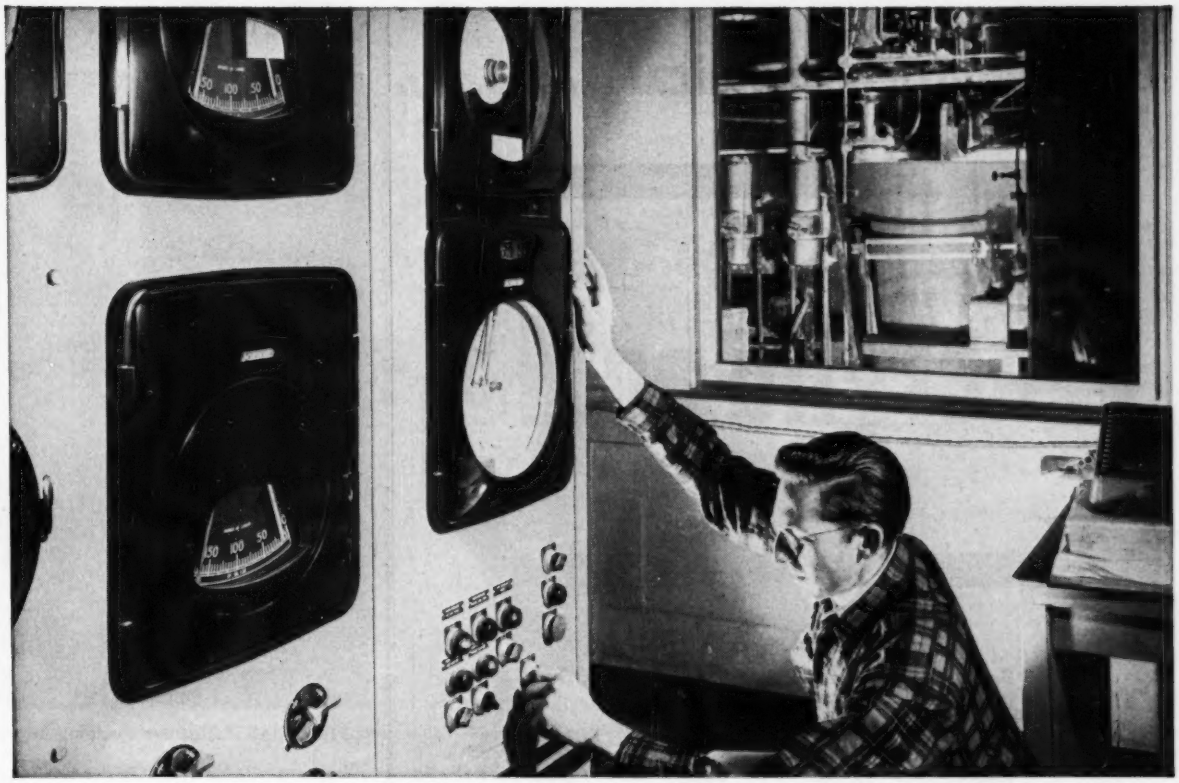
"The pipeline product," says Love, "is essentially coal in a new form and we are now proceeding to develop the commercial aspects of providing sales outlets for it." The reason for his optimism is the successful completion of eight months' operation of a pilot pipeline near Cadiz, O.

The pilot runs were made on a 12-in. pipeline, about 17,000 ft. long and costing $550,000. Here's how it worked: coal was first washed and crushed to a fine size, then mixed with water to form a slurry. The slurry was fed into the line and moved by pumps specially designed for the purpose. Instruments along the line provided engineering data required for a full-scale operation.

The idea, of course, is to eliminate freight rates in moving the coal. Presumably the product would, after drying, make an ideal feed stock for coal-fired generators. It would also fit in nicely with an endeavor like Carbide and Carbon's coal hydrogenation (*CW, May 17, '52*) or PCC's proposed coal carbonization.

Measuring Up

A compound of aluminum and antimony is the latest candidate for semiconductor honors, says A. E. Middleton of Batelle Memorial Institute. He reports it has been used in the laboratory to make rectifiers, says its use in transistors—as a substitute for germanium—is a "distinct possibility." He cites costs of aluminum and antimony, at 50¢/lb., as a decided advantage for the compound. (Germanium sells for approximately $350 a lb.) At the same time he points out that the costs of the raw materials are but a fraction of the total costs for either a transistor or a rectifier.



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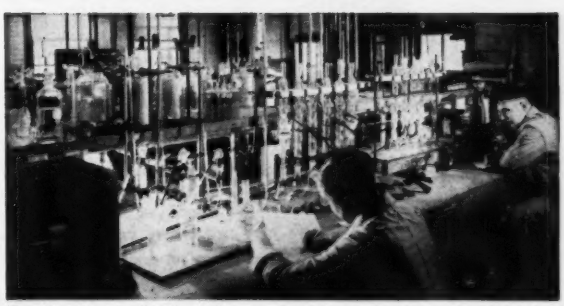

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A wide range of uses for Good-rite Glacial Acrylic Acid is indicated in the plastics industry as a monomer or in the chemical industry as an intermediate. Purity is 96% minimum.

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This week may be the start of spring housecleaning for millions of housewives. But you can't prove it by Lederle Laboratories' William Whitten. For him, master housekeeper of the firm's Pearl River plant, every week is clean-up week.

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the Plant

sistant plant manager in charge of housekeeping. That means he looks after a "house" that consists of 150 buildings and approximately 4,000 employees.

With his six-man team, he tours the plant looking for corroded pieces of equipment, unsightly trash piles, broken and leaky valves. Four "area men" patrol assigned sections of the

. . . are used to scour poultry house and brooders.

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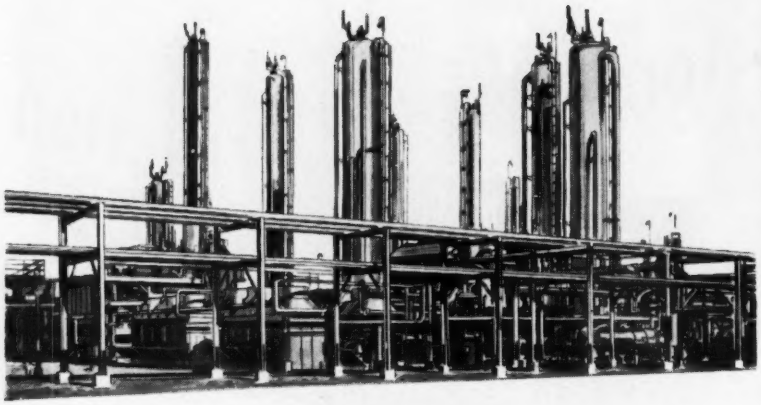

• Technological progress and growth of the chemical industries continue to be swift, steady, and expensive. Money has to come *first*—before research, before engineering, before production and marketing. Financing is a cornerstone of chemical growth.

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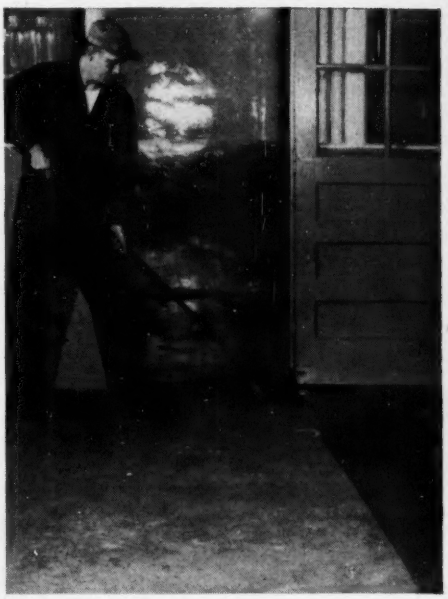

FLOOR SEALING helps maintain sterile conditions in filling operations.

plant every working day, make monthly inspection reports.

But Whitten figures that in the final analysis it's the individual worker's pride that contributes most to a tidy plant. With that in mind, he has established a point rating system for each work area.

For a Purpose: The aim of the housekeeping program is not strictly to maintain appearances, of course. Every plant manager prides himself on his ability to "keep a good house." He knows it makes for safer, more efficient production.

In a complex operation like Lederle's, however, keeping the area clean is a full-time job. Recently, in fact, 30 large manufacturing companies teamed up to form the Industrial Sanitation Management Assn. Fittingly enough, they elected Whitten first president.

EQUIPMENT . . . .

Getting Bigger: The Pfaudler Co. (Rochester, N.Y.) recently augmented its line of glassed steel reactors with new models in increasing capacities. Along with its standard 200 gal. to 2,000 gal. sizes, Pfaudler in now offering series R96 and R108 with 3,000, 3,500, 4,000 and 5,000 gal. capacities.

•

Push-Button Blaster: American Wheelabrator & Equipment Corp. (Mishawaka, Ind.) just added a new push-button model to its line of wet blasting machines. Designed to clean and finish small pieces, the model 30

Will You Share in the Profits of "Sell-on-Sight" Garden Furniture?

These Joseph Tanaka designs of "garden furniture with a difference" are typical of the unique new lines which can be produced with polyester glass-fiber laminates.

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With polyester resins based on Monsanto's **STYRENE MONOMER**, rigid, durable pieces like these can be molded in one operation from mats of glass fibers. The finished products are weatherproof, alcohol proof, stain resistant and sturdy. No need to "paint" . . . color can be molded-in! Established fabricators, experts in lamination, can produce custom-made sections or entire pieces of furniture . . . just as they now make products for electrical appliance producers, bakeries, sporting goods manufacturers and a variety of other fields.

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PRODUCTION . . . . .

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Versatile Pump: Philadelphia Pump and Machinery (Wynnewood, Pa.) lays claim to a proportioning pump that incorporates several new design features including: construction that permits removal of all moving parts through the cross-head without breaking piping connections; a packing gland open at both ends to simplify replacement of packing; a grease lantern ring that can be easily changed to a water seal for handling suspended solids or corrosive materials.

•

Boost for Zirconium: Fabrication of zirconium on a full scale in 1953 was predicted by Westinghouse Scientists R. B. Gordon and W. J. Hurford of the company's Atomic Power Div. at the American Society for Metals meeting in Los Angeles last week. They reported that the Bureau of Mines began production of the first commercial size ingots and started experimental fabrication in commercial facilities last year.

•

. . . And for Copper: Also at the Los Angeles meeting of the ASM came word of a new copper-base alloy that could prove valuable in electrical equipment and instruments where high-strength springs are required. J. H. Jackson, speaking for his associates at Battelle Memorial Institute (Columbus, O.), described the alloy that was developed as a possible replacement for beryllium-copper alloys for some applications. The alloy consists of copper, nickel, silicon and aluminum, is not as good as copper-beryllium so far as electrical conductivity and strength are concerned, but is expected to be cheaper if mass-produced.

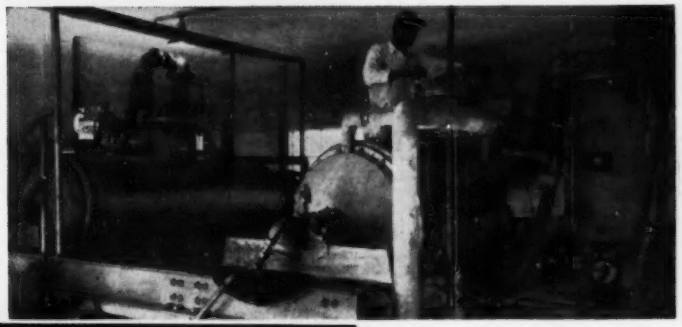
•

High-Pressure Manometer: Fischer & Porter Co. (Hatboro, Pa.) is introducing a U-tube mercury manometer capable of routine operations at pressures up to 5,000 psi. Advantages claimed for it: elimination of problems of pressure-tight bearings, lubricants and leakage of fluids; possibility of use with corrosive fluids, no loss of mercury; temperature compensation to assure accuracy under varying ambient conditions.

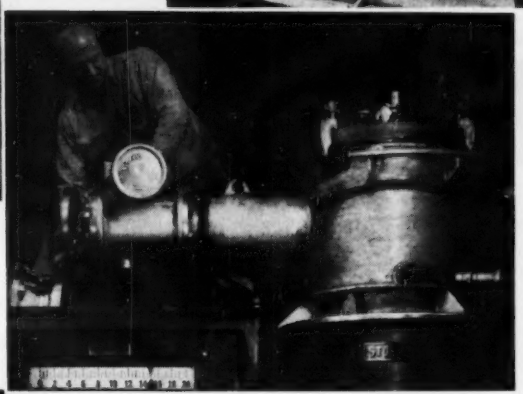
•

Current Switch: Heating a 7,700-lb. aluminum ingot to working temperatures of 750 F. takes about 12 hours by conventional methods. But Alcoa (Pittsburgh) recently succeeded in doing it in 15 minutes—by using ordinary household electric power.

Operator removes boxes of tubular paper capacitors from Stokes Vacuum Impregnator at Pyramid Electric Co., North Bergen, N. J. Capacitors have been impregnated with mineral oil to improve stability and lengthen service life.



Installation of Stokes Rotary Vacuum Dryers used by Metals Disintegrating Co., Berkeley, California, for drying of aluminum powder. Highly oxidizable materials can be handled without any danger of combustion or explosion when processed in vacuum.



Operator transfers evacuated retort from heating to cooling station of Stokes Vacuum Annealing Furnace, built for processing, annealing and other heat treatment of titanium, zirconium, hafnium and copper.

Operator loads shell-frozen human blood plasma into one of the Stokes drying chambers of the lyophilizing plant at the Sharp & Dohme, Inc. biological laboratories, Glenolden, Pennsylvania.

There is no romancing about Vacuum at Stokes!

Vacuum processing starts with a vacuum-tight system and pumps to exhaust the air.

These are simple truths, the significance of which is never forgotten among men who have worked for many years in vacuum engineering.

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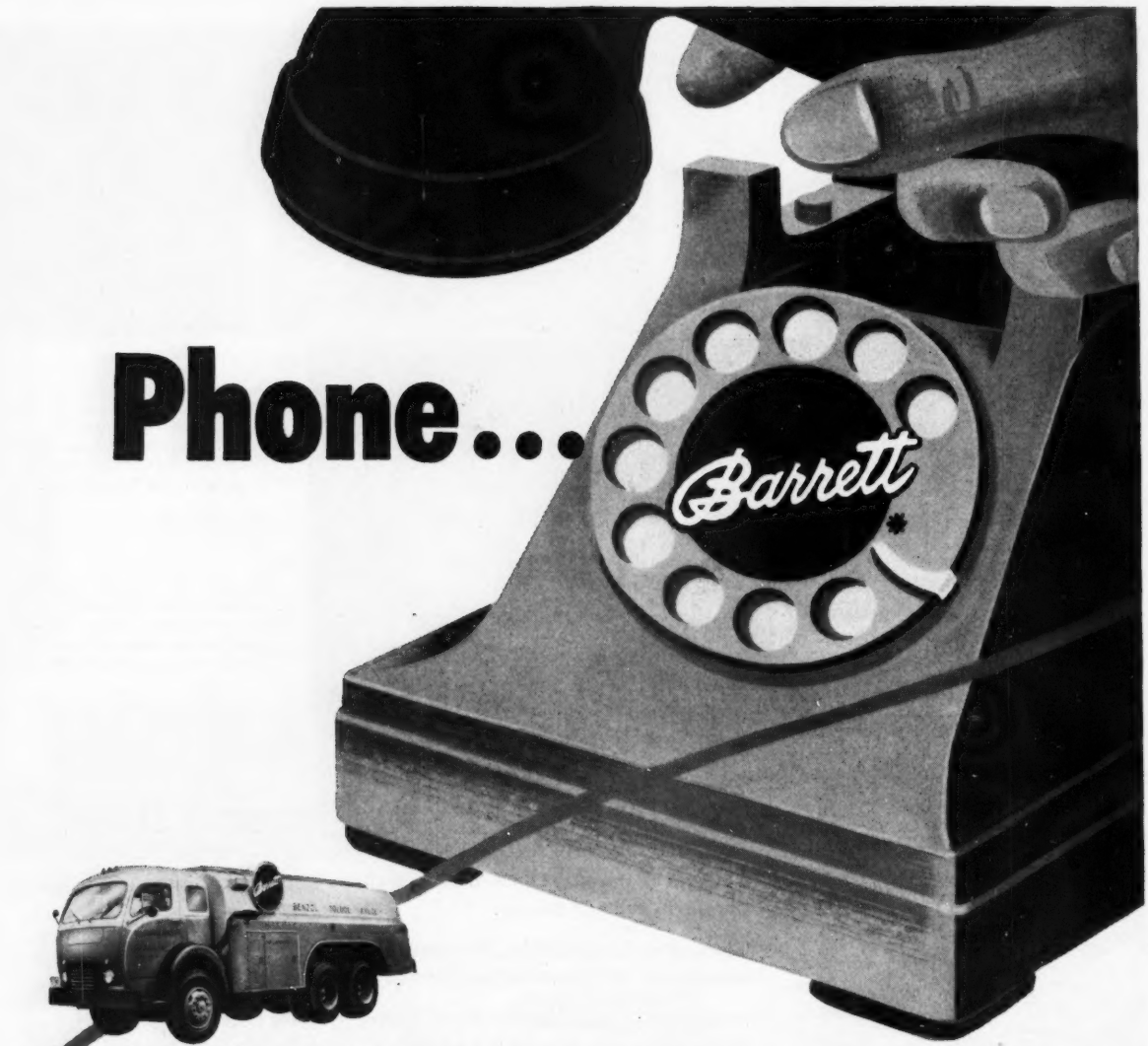

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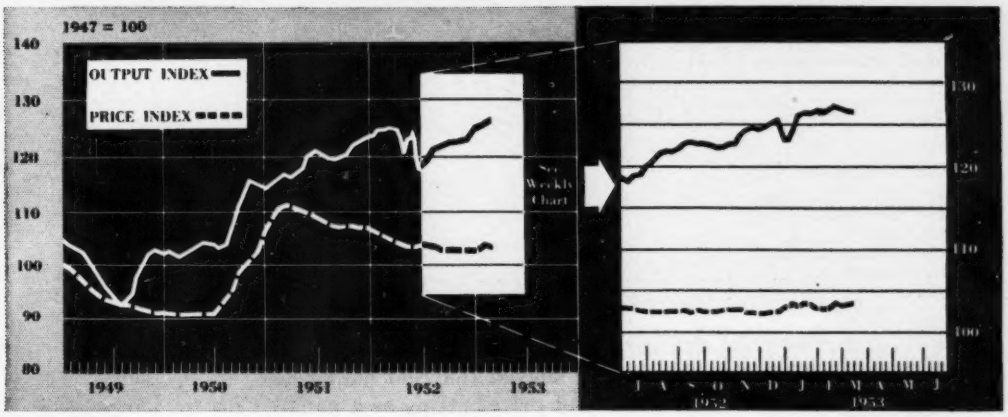
MARKETS . . . . . .



CW Index of Chemical Output—Basis: Total Man Hours Worked in Selected Chemical Industries
CW Price Index—Basis: Weekly Prices of Sixteen Selected Chemicals

MARKET LETTER

Although a comparatively mild winter put the chill on methanol consumption in antifreezes, most synthetic producers aren't as upset as they might be. Soothing factors: heavy formaldehyde production has blotted up considerable quantities; stepped-up demand of the armed forces has—and will—siphon off another goodly amount (as an admixture in aviation fuels); calls from methacrylate makers have been fairly steady and will probably remain so.

Natural methanol demand, too, is breezing along at a good clip. And the reason is tied in with continuing high production of alcohol for which virtually all natural methanol output is gobbled up as a denaturant.

Price-wise, however, observers see no change in schedules—at least not during the next two months.

Big news in the paint industry last week was the Navy's decision to step around to the front of the paint market counter—from manufacturer to buyer of varnishes, enamels and standard-type paints.

All paint production operations will be shut down—except for hush-hush formulas—at the government's two continent-divided plants at Mare Island, Calif., and Norfolk, Va.

Said the National Security Industrial Assn., which recommended the action: besides being economically unsatisfactory, the Navy's paint-making installations are both on the coasts and it would take only two bombs to wipe out the sea arm's paint sources.

The strong cord of military need continues to tie up big chunks of many chemical items, leaving civilian consumers limping along on producers' allotments. Prime example: toluol—both coaltar and petroleum material—tight for some months, is now being labeled critical in a few sections of the country.

The heavy pressure on the over-all toluol market, of course, comes from the nation's T.N.T. and aviation gas programs. And there's no promised easing of the situation in sight.

On the other hand naphthalene makers would welcome some buying pressure. Domestic crude demand has slowed down to a snail's pace with only contract customers dipping into the ample supply.

MARKET LETTER

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
CHEMICAL WEEK Output Index (1947=100)	127.0	126.7	124.9
CHEMICAL WEEK Wholesale Price Index (1947=100)	104.1	103.9	103.8
Bituminous Coal Production (daily average, 1,000 tons)	1,353.0	1,410.0	1,587.0
Steel Ingot Production (1,000 tons)	2,273.0(est.)	2,324.0(act.)	
Stock Price Index of 14 Chemical Companies (Standard & Poor's Corp.)	260.0	261.3	232.9

MONTHLY INDICATORS—Wholesale Prices (Index 1947-1949=100)	Latest Month	Preceding Month	Year Ago
All Commodities (Other than Farm and Foods)	109.6	109.9	114.3
Chemicals and Allied Products	103.6	103.6	106.7
Industrial Chemicals	113.1	112.8	118.1
Drugs and Pharmaceuticals	91.4	91.5	94.8
Fertilizer Materials	112.7	112.9	109.4
Oils and Fats	52.7	53.5	56.8

Import prices are being shaved (current quotes 3¢-3½¢/lb.), but even the razor-wielders despair of price-cutting as a panacea for the slowness in the over-all market.

There's a ray of hope, though, for refined naphthalene. The upcoming moth control season should boost demand for this material as well as for paradichlorobenzol.

New sulfur price tags were written late last week by the No. 1 U. S. producer, Texas Gulf Sulphur. Clamped to price levels under other producers prior to decontrol, the big outfit literally leap-frogs over No. 2 Freeport Sulphur's domestic schedules.

Here are the new prices as posted by the two top concerns: f.o.b., at the mine, per ton, $26.50 by Texas Gulf, as against Freeport's $25.50; aboard ship at Galveston, an even $28/ton for Texas Gulf material, vs. Freeport's $27.50.

In the export market, however, the latter's recent $4/ton hike (to $30.50, f.o.b. port) tops T. G.'s heretofore unpublished $28/ton price.

Ammonium nitrate producers, resellers and consumers all agree the ag chemical is tighter than the shell on a pecan. One maker tells CW it's an almost "intolerable situation," with area distributors chalking up long lists of clamoring customers.

Hint of the paucity lies in jobbers' near $100/ton quote—if and when available. Some suppliers are urging fruit growers to take more-plentiful urea with a "just as good" pitch.

And polyethylene users are also being pinched for supplies. NPA last week heard complaints from plastic container manufacturers to the effect some companies are not getting a "fair supply."

The military is still taking about a third of all polyethylene flake production, but NPA officials say the plastic would still be hard to come by even without the high armed services grab.

Depressed meal prices are squeezing linseed oil schedules to higher levels. Most crushers are quoting a rough near-16½¢/lb. for tankcar, delivered-in N. Y. material.

SELECTED CHEMICAL MARKET PRICE CHANGES—Week Ending March 30, 1953

UP

	Change	New Price		Change	New Price
Methyl cyclohexanol, drms, c.l., wrks	$ .01	$ .355	Linseed oil, raw, t.c., f.o.b., NY	.002	.1645

DOWN

	Change	New Price		Change	New Price
Crude naphthalene, imp. 78 deg.	.0005	.0325	Inositol, drms., dlvd.	1.10	4.50

All prices per pound unless quantity is stated.

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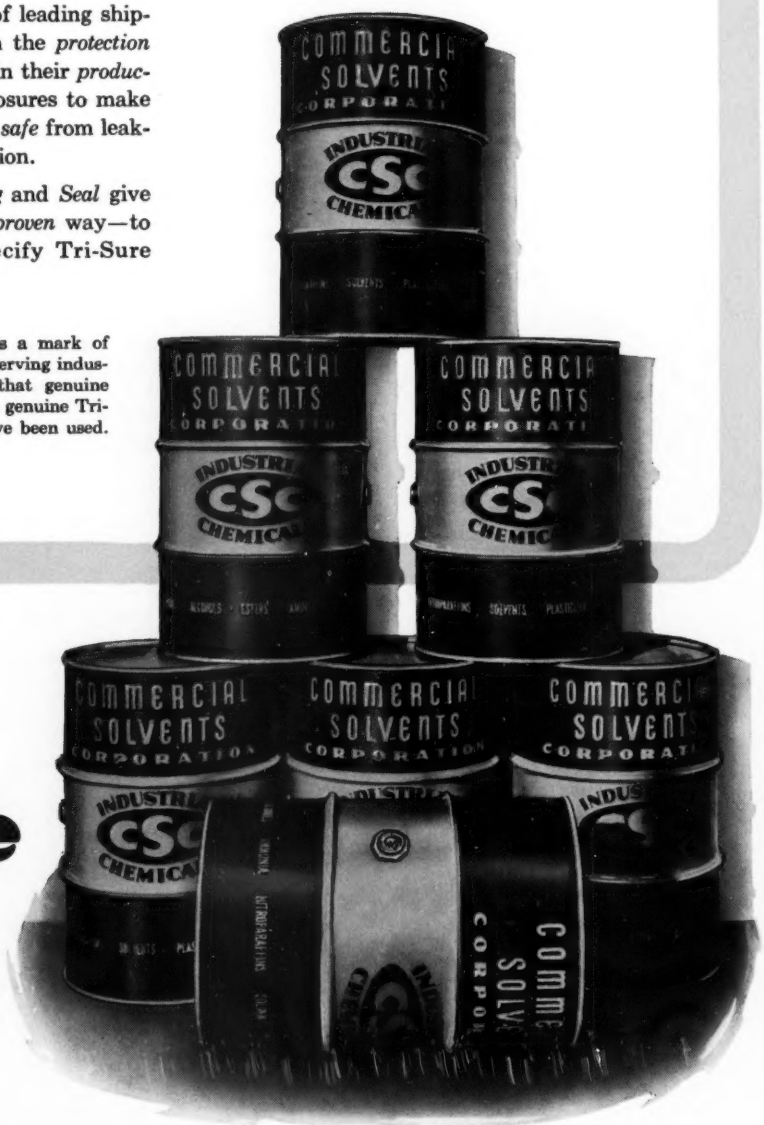
*The "Tri-Sure" Trademark is a mark of reliability backed by 30 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure dies), Plugs and Seals have been used.



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FERTILIZER SUPPLY

(in tons)

Year	NITROGEN	AVAILABLE P_2O_5	POTASH
1900	62,000	246,000	86,000
1920	228,000	660,000	258,000
1940	419,000	912,000	435,000
1950	1,126,000	2,071,000	1,215,000
1955 (USDA Goal)	2,185,000	3,485,000	2,185,000

No Ceiling On Supply

The era of "you never had it so good" may be waning for U.S. farmers. Pinched as they are between the steadily increasing costs of production (seed, labor, machinery, taxes, etc.), and dipping crop prices (down an average of 15% on nine farm commodities over the past year), the nation's breadbasket fillers may well heed the current advice of a paternalistic government and the concerned fertilizer industry associations (notably The National Fertilizer Assn.).

Here, say the Department of Agriculture and the associations, is at least one way to ease out of the cost-price squeeze: step up yields per acre, reduce unit production costs through good farming practices—and the accent is on the use of more and more fertilizers.

USDA Prognostics: Last week, USDA rescanned its estimate of plant nutrients required in 1952-53, and, after much refiguring, substantially confirmed what it predicted last September. The earlier figure is shaved by roughly 1%, but the picture is as rosy as ever.

The Production and Marketing Administration last fall estimated that 1952-53 would set another all-time high, and that the aggregate supply of primary plant nutrients would exceed, by about 12%, the record supply in 1951-52. The USDA estimate of nutrients then was 5.9 million tons; the new figure is 5,815,500 tons or 11% over the 1951-52 total of 5,245,000 tons.

Here's the government's breakdown for the upcoming year:

Nutrient	*Amount* (million-tons)	*% over 1951-52*
Nitrogen	1,660	16.5
Phosphates	2,410	8.0
Potash	1,745	10.0

Big Question: Poser for fertilizer mixers—some of whom are still wrestling with the problem of jammed storage space—is this: will the farmers use all the available supply? Washington's answer is yes. These officials say reports that farm income is going down, that farmers will buy less, are based on over-emphasis of farmers' slack buying during recent months. This may be so since winter months are generally not "high-buy" months for tillers of the soil.

Moreover, the experts feel that two forces will tend to boost and keep fertilizer sales high:

- The current USDA and industry campaign, which induces farmers to use more fertilizer and—more important—to use it more efficiently.
- Farmers' own desire to cushion any fall in prices with larger production.

Reasoning behind USDA's drive: our population is growing by more than two million a year, but the number of productive acres to feed these people is not keeping pace.

Bolstering Research: There's a solid backing of research behind the campaign to jack up yield, income and nutrients sales. Boiled down, the USDA's program hits these objectives:

1. Improving fertilizer technology to overcome the limiting effect on production of any sulfuric acid pinch and at the same time to encourage high-analysis mixed fertilizers that will have improved physical condition and be suitable for year-round storage and use.
2. Marketing of fertilizer to evolve more efficient methods of distribution and more economic forms of material.
3. Development of equipment for fertilizer placement to obtain highest production.
4. Soil and plant analysis to pinpoint fertilizer needs.
5. Research on physical response and economic levels of use to enable farmers to learn the most profitable rates of application.

One target in the government's large-scale fertilizer selling effort is the fertilization of forage crops and grain, which in most instances now receive no fertilizer at all. As a glittering inducement, USDA points out that corn yield could be tripled over the average 26 bu./acre if high rates of fertilization were practiced along with good management practices.

Ever Higher: There is no ceiling on the amount of fertilizer that will be consumed—at least no estimate of a "dead-end" quantity can be worked out by the experts. The future still presents an ever-expanding vista.

A glance at the table above shows this steady growth from 1900 through the goal year 1955.

Back in 1951, the Department of Agriculture estimated fertilizer requirements for the 1955 growing season. These goals call for the plant capacity to turn out 2,185 million tons of N; 3,485 million tons of P_2O_5; 2,185 tons of K_2O.

It's interesting to note that with the goal less than two years off primary plant nutrient manufacturers can now supply 74% of the USDA 1955 requirements. Nitrogen makers can now turn out 76% of the goal figure; phosphatic fertilizer manufacturers can hit 69%; and potash production is already crowding 80% of the goal requirements.*

Ominous Portents: But although farmers are currently buying nearly $1 billions worth of fertilizers a year—about double the 1946 demand—the sales picture has some streaks of darkness through its rosy hue.

Potash supply is catching up with demand. Larger quantities of potash are entering the U.S. from overseas, particularly from Germany.

Phosphate and nitrogen demand is somewhat spotty; prices have broken in some areas.

And dirge-drummers, bemoaning foreign competition and losses of overseas markets for U.S. material, say these factors will have greater effect on the market this year than any year since the close of World War II.

For example, Brazil is expected to import less fertilizer this year. Reason: shortage of foreign exchange. Israel has blue-printed additional ammonium phosphate production facilities; South-

* These figures include import and export figures.

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MARKETS. . . . . .

ern Tunisia is the site for a new French phosphate rock installation; hot-spot Turkey is building a superphosphate plant using sulfuric from a soon-to-be-built sulfur-from-smelter gases recovery plant.

U.S. Burgeon: Meanwhile, the expansion of domestic production facilities continues unabated. As of last month, Defense Production Administration had issued 27 certificates of necessity under the phosphate expansion program.

This expansion should bring in about 767,000 tons of P_2O_5. And add to this another 300,000 tons that should annually pour out of the plants that are going up without benefit of accelerated amortization certificates.

DPA's nitrogen expansion program —which will increase annual production capacity 1,390 million tons over 1950 output—is practically completed. The agency tells CW that most of the facilities for which certificates were issued for this increase are already a-building or ready to produce.

There are a few small firms holding certificates, however, who have not yet started their construction; but DPA is not pressuring them to start. Reason: they're all newcomers in the field and are having some difficulty getting started. And besides, output expected from these small companies is minuscule compared with the total asked for.

Last August, when the potash annual production goal was set up (2 million short tons by 1954), no certificates were handed out because expansion then under way was more than enough to hit the target.

Let's Use It: With more than enough fertilizer in sight the big problem facing USDA and industry is to get the ultimate consumer to use the material.

The typical slant to the pitch being tossed at farmers is the effect it will have on his pocketbook.

For instance the "educators" go along with the farmers' contention that he must reduce expenses on items that do not offer adequate return, but, they are quick to point out, fertilizer does not belong in this category. And as a dollars-and-cents prop to the argument, some convincing farm business statistics are quoted.

While, in 1940, one dollar invested in fertilizers brought a $2 dividend in extra crops, six months ago a single dollar brought an average return of $3.75—which makes a mighty convincing adjunct to the reiteration that increased fertilizer use is the farmers' best way to beat the lower farm prices-higher costs squeeze.

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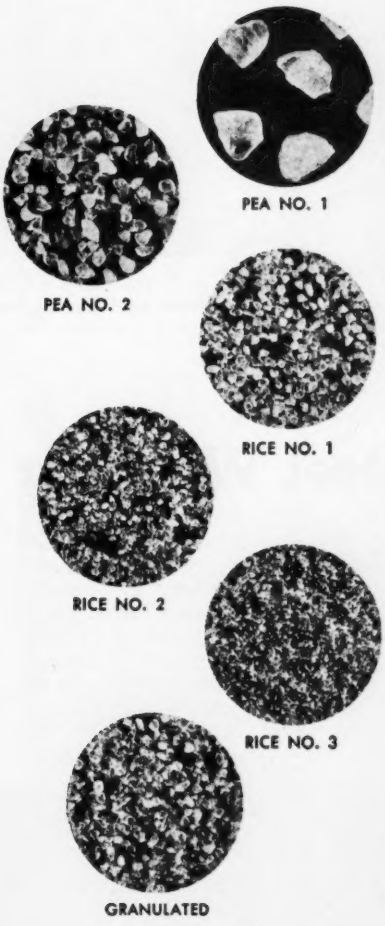

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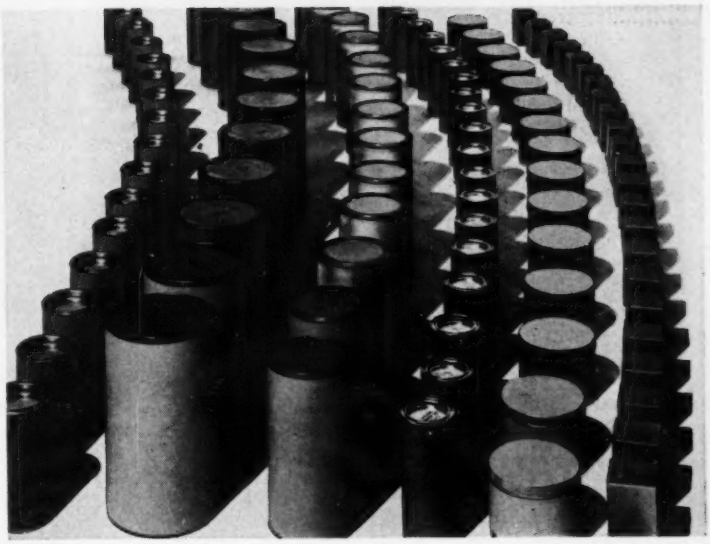
Rice No. 2	0.065" to 0.088"
Rice No. 3	0.025" to 0.065"
Granulated	less than 0.115"
Powdered	less than 0.025"



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That's why shippers of pharmaceuticals are currently being courted by Dravo salesmen, who are touting a "cut your pilferage with a Transportainer" theme.

The 275-cu.-ft. containers are actually a "service" offered by the steamship lines themselves. They own the boxes (cost: $466 each) and use them either on their own initiative (when a vulnerable cargo is accepted) or at the request of the shipper. One line alone now has nearly 40 of the boxes in constant service.

The exporter pays only on the gross weight or cubic footage of the material actually shipped—there is no extra charge for the container. Moreover, many of the shippers find that they can realize a further saving by eliminating export packaging. Domestic cases can be put directly into the Transportainer, resulting, for one company, in an average saving of $150 for every container-load of cargo.

4 DURING UNLOADING at dockside. In one transfer, the cartons are moved from the company's truck to the . . .

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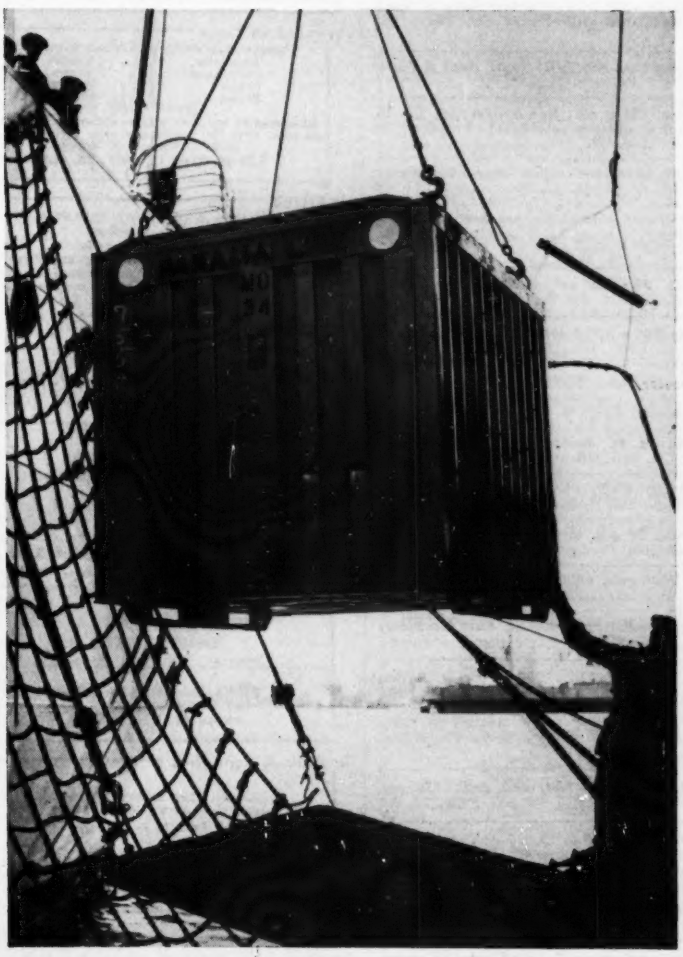
3 COMPANY TRUCKS are used for delivery to the pier, allowing Squibb men to protect the contents from pilferage and damage . . .



6 FINAL STEP is to lift the locked and loaded container aboard ship. It will stay sealed until opened by recipients at foreign port.

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Mixer 140 cu. ft. double shaft, Paddle. Heat & Power Co., Inc., 70 Pine St., N.Y. 5.

Pebble Mills; 8'x8', Porcelain lined. First Ma-chinery Corp., 157 Hudson St., N.Y. 13, N.Y.

Pebble Mills 10 gal. to 800 gal. porcelain lined 20. Consolidated Prod., 18 Park Row, N.Y. 38.

Reactor, 2000 gal., acid glass, ASME U69. Heat & Power Co., Inc., 70 Pine St., N.Y. 5.

Reactors, Pfaudler Jktd. 400 Ga. First Machinery Corp., N.Y. 13, N.Y.

Strainer Water-C.I., 16", Twin, Type R, Basket type Std. Const. 100 lb. Pressure. Serial No. 44052, Elliot Co., 740 11th Street, N.W., Washington, D.C. Used only a few months, condition is excellent. $1000. Equipment, Inc., Phone 844, P.O. Box 479, Hopewell, Va.

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The system operates best, of course, for movements in which the recipient can take delivery directly from dockside at the foreign port. It loses value when a further shipment by truck or train is required. But with higher-priced medicinals and chemical specialties as the brightest stars in the chemical export galaxy (*CW Report, Jan. 3*), it seems certain that the industry's traffic managers will be finding an increasing use for the pilferproof ocean-going boxes.

For Chemical Orphans

At least nine out of ten industrial research projects land up in a fruitless blind alley. But along the way, noncommercial compounds are often synthesized and these compounds may be of immediate interest to other researchers, elsewhere, working on different problems. Finding new homes for these industrial orphans is the nub of a one-man project just initiated by Stuart Canter, operating as the Chemicals Procurement Co. (New York City).

His plan is to solicit the interest of major industrial concerns having extensive research and development programs. The enticement: a chance to recoup a part of the cost of written-off research work—plus the long chance of hitting an active new market. As for Canter, himself, it means additional variety and sources for his stock in trade: rare and unusual chemical compounds.

Chemicals Procurement Co. is hardly alone in this particular market. Now 2½ years old, it is bucking competitors who can trace their middle-man profession back to the beginnings of modern chemistry. They've existed because there has always been a wide departure between the number of compounds that can be theoretically synthesized and those that are commercially available.

To fill this gap, rare-chemical merchants set themselves up as abstract-reading liaison men between researchers. Their sources have been mainly the bevy of custom-chemical manufacturers who range in size from a-man-in-a-cellar up to integrated, highly specialized commercial firms. Their customers are researchers looking for a more advanced intermediate to hasten their experiments.

On the Shelf: Canter's operation fits this mold. But from the start, he has put his emphasis on searching out the dust-gathering unusual chemicals that abound in all spots where chemical researchers have worked—and that have not heretofore seen commercial light.

His first effort was directed at lining up college and university laboratories. This took basic missionary work, and for two years it was a highly unprofitable venture. But now the idea seems to be taking hold—and the attack on industrial laboratories is a natural outgrowth of the academic proselyting.

All of this grew out of an experience Canter had while preparing a postgraduate thesis at Brooklyn Polytech. His experimental work was cut in half when he accidentally discovered that several pounds of an intermediate —which he had been laboriously preparing—were in bottles that had lurked for years on an American Cyanamid laboratory shelf.

His bet, today, is that there's a profit to be made from taking the accidental factor out of such occurrences.

Distribution Changes

A $500,000 office building about to be erected in Birmingham, Ala., will be the future home of Union Carbide & Carbon's offices in that city. Liberty National Life Insurance Co. is constructing the building, will lease it to UC&C when completed early next year.

• Pigment Color Div., United Wallpaper, Inc., has appointed M. H. Baker Co. (Minneapolis) as its sales representative for the states of Iowa, Minnesota, Nebraska, and South and North Dakota.

• For the western states, Schwartz Chemical Co. (New York) has picked Plastic Materials Supply Co. (Temple City, Calif.) as its distributor.

• Plans are being laid for the shipment of ethylene glycol from Du Pont's new Dacron fiber plant at Kinston, N.C., to Dow Chemical's plant at Freeport, Tex. The shipments would go through the state-operated port terminal at Morehead City, N.C., where two tanks will probably be built for Dow by the state authorities.

The plan apparently is for Dow to ship "virgin" glycol to Du Pont by rail from Freeport. Then, after it has been used, the contaminated chemical will be returned by tanker to Texas for purification. The new tanks will hold the spent glycol until enough has been accumulated to warrant a tanker stop-off.

•

More Ore: Four new ships are being built for Alcoa's 44-vessel bauxite fleet. The largest is a 31,000-deadweight-ton carrier being built in a British shipyard. The others are being constructed in Sweden. They will be put into service to bring ore to

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Alcoa's Gulf of Mexico ports from Point Tembladora, Trinidad.

•

Saran on Steel: Rheem Manufacturing Co. has introduced a new saran-lined drum. Designed for frozen-food uses, it may have chemical applications. An Epon undercoat is applied to the steel before laminating with saran.

•

Sealed Bags: Claiming to be one of the first companies to warrant the strength of the seal for the life-use of its polyethylene liners and bags, Plastic Packaging Co. (Chicago) is offering to accept actual-damage liabilities up to $25,000 per contract year—provided the individual claims are over $50 each.

•

In Water: American Cyanamid Co. is offering trial-lot quantities of acrylic acid as a 50%-solution in water.

•

No Credit: Exactly a year ago, Shell Chemical Corp. discontinued its practice of charging a $10 deposit on drums, and offered a $1.75 per used drum instead. Now that, too, has been discontinued because Shell's customers were sending in drums faster than they could be reconditioned.

•

More Course: A new form of acetophenetidin is being offered by Organic Chemicals Div., Monsanto Chemical Co. A course powder, it is said to be more free-flowing than the standard fine-powder grade.

•

For the Files: Bakelite Co. has revised its "Bakelite Polyethylene" booklet to make it a 24-page, 43-photograph manual on the fabrication and handling of the plastic.

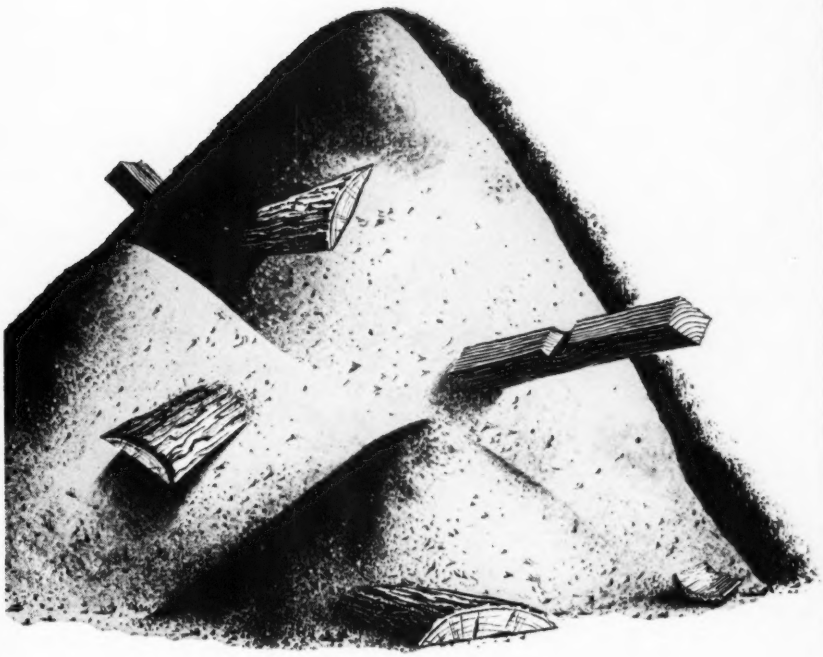
• Trubeck Laboratories (E. Rutherford (N.J.), has published a small folder on its line of industrial and pharmaceutical intermediates.

• "How to Pack It" is the title of a 30-page booklet on corrugated boxes being distributed by Hinde & Dauch Paper Co. (Sandusky, Ohio).

• "The Celite Story" is a colorful 26-page pamphlet on the origin, production, and application of diatomaceous silica products. It's available from Johns-Manville Corp. (New York, N.Y.).

• With termites coming into their active season, Dow is issuing a do-it-yourself booklet entitled "The Handyman's Guide to Home Wood Preservation."

• National Wooden Box Assn. (Washington, D.C.) is offering a guide to "Export Packaging."



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